INDIA
RUBBER WORLD

JANUARY, 1948

CABOT

Sterling 99

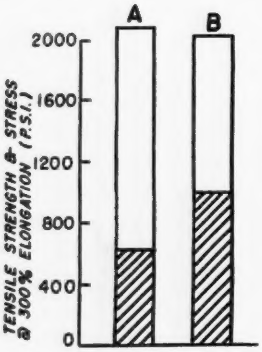
Rapid Dispersion
Low Milling Temperature
Smooth Extrusion
High Electrical and Thermal Conductivity
High Reinforcement

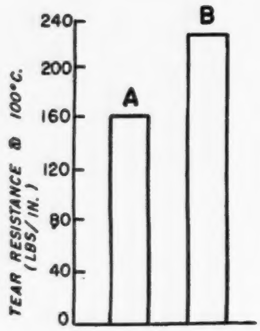
GODFREY L. CABOT, INC.
77 FRANKLIN ST., BOSTON 10, MASS.

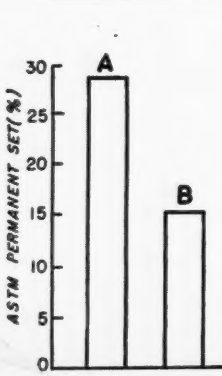
Physical Properties of Test Compounds Cured 10 Minutes @ 298° F.

TEST COMPOUNDS

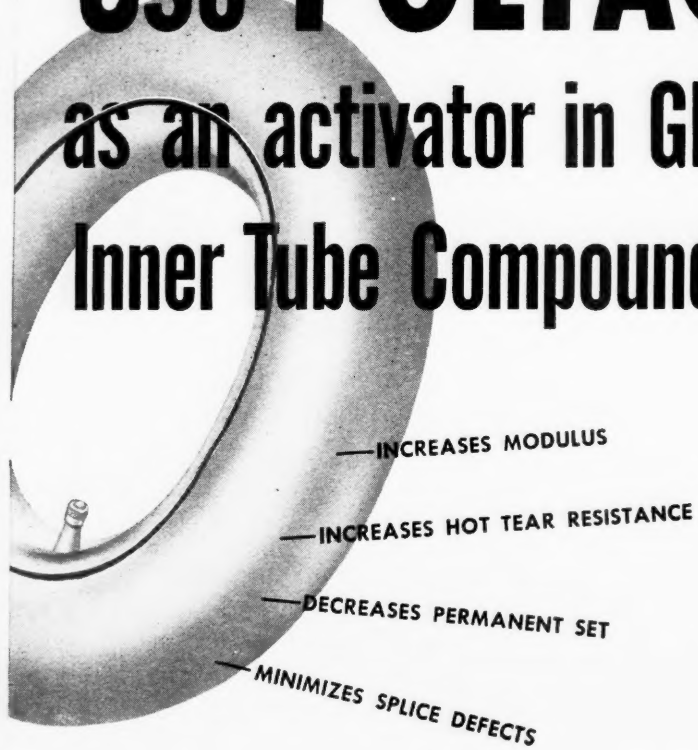
	A	B
GR-I	100.0	100.0
Fine Furnace Black	50.0	50.0
Sulfur	2.0	2.0
Zinc Oxide	5.0	5.0
Magnesium Oxide	3.0	3.0
Stearic Acid	2.0	—
Paraffin	—	1.0
Thiuram M	1.0	—
MBT	0.5	—
Thionex	—	1.0
Polyac	—	0.5
Williams Plasticity	119	128
Williams Recovery	14	58







Use POLYAC as an activator in GR-I Inner Tube Compounds



As evidenced by the bar graphs, the physical properties of GR-I inner tubes are substantially improved by Polyac activation of Thionex as compared to a Thiuram M-MBT combination.

In addition to improved vulcanizate properties, Polyac provides a unique stiffening effect in the uncured compound, thus minimizing the tendency of GR-I inner tubes to thin out at the splice.

For detailed suggestions on the use of Polyac in GR-I inner tubes, consult report BL-177. If you would like an extra copy, write E. I. DU PONT DE NEMOURS & CO. (INC.), Rubber Chemicals Division, Wilmington 98, Delaware.

Tune in to Du Pont "Cavalcade of America," Monday Nights—8 p. m. EST, NBC

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del

BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

DU PONT

INDIA RUBBER WORLD, January, 1948, Vol. 117, No. 4. Published Monthly by BILL BROTHERS PUBLISHING CORP., Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second-Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription, United States and Mexico, $3.00 per year; Canada, $4.00; All Other Countries, $5.00; Single Copies 35 Cents. Address Mail to New York Office.

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JAN 30 1948
DETROIT

TWO NEW HYCAR AMERICAN RUBBERS

Hycar OR-25 EP *(Easy Processing)*
Hycar OR-25 NS *(Non-Staining)*

HERE are two new American rubbers, both with superior processing characteristics. Hycar NS and Hycar EP differ only in that a special anti-oxidant has been used in the NS, making it non-staining and non-discoloring. This is an outstanding quality, particularly desirable in the fabrication of light colored products. The new Hycar rubbers have all these advantages over the regular process Hycar OR-25:

1. **They band on the processing mill speedily—cut mill mixing time.**
2. **Better extrusion characteristics—less nerve and less heat build-up.**
3. **Excellent high temperature mixing.**
4. **Better fusion and mold flow characteristics.**
5. **Increased building tack for laminated products, such as frictioned stocks and calendered sheeting.**

Both rubbers retain those properties which make Hycar American rubbers so usable for so many products . . . permanent resiliency and superior resistance to oil, abrasion, and aging. Ask your supplier for parts made from Hycar. Or write to Dept. HA-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Hycar
Reg. U. S. Pat. Off.
American Rubber

B. F. Goodrich Chemical Company A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

YOUR BEST RESOLUTION—FOR 1948!

NO. 1—USE PHILBLACK O . . . it helps you obtain the high quality you want in your rubber products. Philblack O is the HAF (high abrasion furnace) black that gives tires long life.

Laboratory data and numerous road tests have proved that this is a profitable resolution to keep . . . that by using Philblack O, your rubber products will have plus-value ruggedness and stamina.

So start now to keep resolution No. 1 . . . order Philblack O today and use this newly developed black in your products.

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Rubber Chemicals Division

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LD


in 1915...
Naugatuck Chemical began the manufacture of Anilin Oil, the first organic accelerator used by the rubber industry.
Since that time, Naugatuck Chemical research and development has continued to provide new, superior chemicals for the rubber industry.
Today, Naugatuck Chemical offers a complete line of antioxidants, accelerators and processing aids, plus the accumulated experience of over thirty-two years of solving rubber compounding problems.
This background of experience is available to you.
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Division of United States Rubber Company
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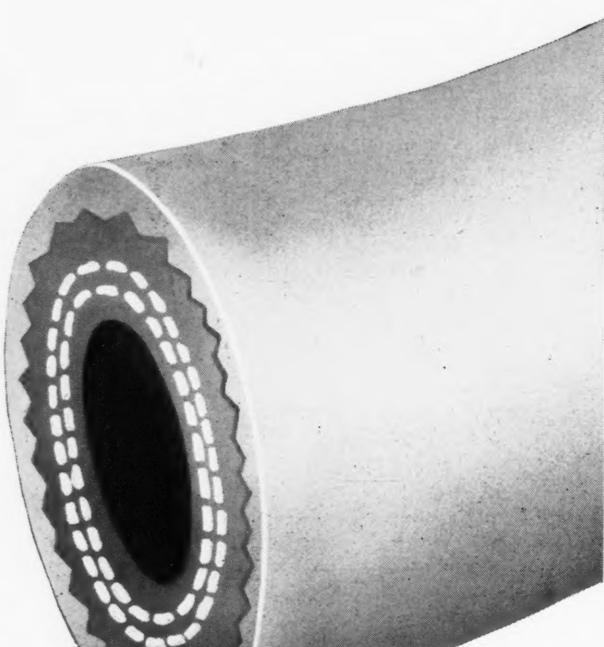
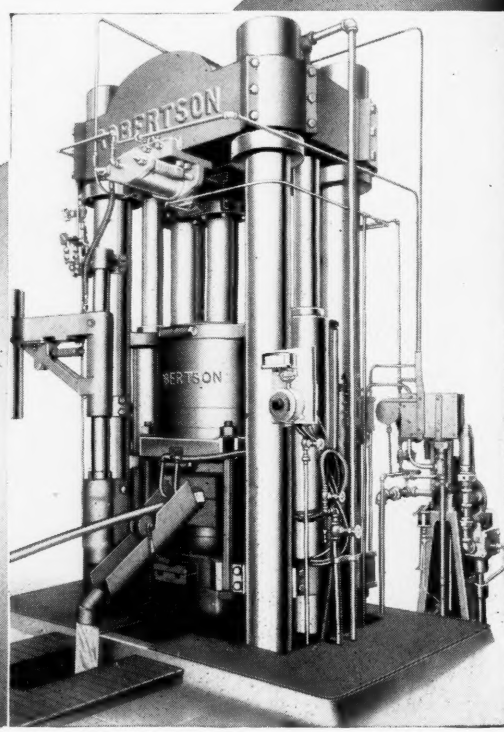
Thousands of Miles
OF UNCURED RUBBER HOSE

in leading plants of the hose industry . . . pass through Robertson Hose Lead Encasing Presses and come out *perfectly sheathed, ready for vulcanizing.*

And, not only does Robertson make the Presses, but they produce the High Pressure Hydraulic Pumps, Lead Melting Pots and Lead Stripping Machines to make complete, highly efficient installations.





Robertson . . . has for over 89 years . . . specialized in the design and manufacture of High Pressure Hydraulic Equipment. Consult them about your specific requirements.

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Designers and Builders of all Types of Lead Encasing Machinery
Since 1858

For technical data please write Dept. CA-1

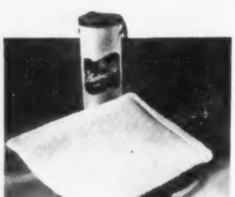
B. F. Goodrich Chemical Company A DIVISION OF THE B. F. GOODRICH COMPANY

ROSE BUILDING, CLEVELAND 15, OHIO

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

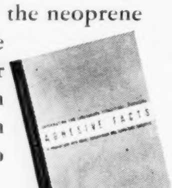
G.E. Uses BOSTIK CUSTOMIZED ADHESIVE #1032 for Bonding Neoprene Fabric to Itself in Waterproof Heating Pad Assembly

HERE'S HOW:



Say the engineers of the Automatic Blanket and Sun Lamp Division, General Electric Company:

"We apply BOSTIK No. 1032 to the margins of neoprene-coated fabric, and let it dry about three hours. When solvent has evaporated, we install the heating unit, fold the neoprene over, and subject the seam to a pressure of 60 psi at a temperature of 300°F. for one minute. The bonding process is then complete. We use heat in our operation with this cold drying cement in order to get quick initial set, thereby facilitating handling. The following day we run our dielectric tests."



Other important manufacturers, too, are daily finding the value of BOSTIK *Customized* Adhesives — built to do the *particular* job. Whatever materials, or combination of materials, you wish to bond together, call on B B. Remember, there's a BOSTIK *Customized* Adhesive for every bonding need, ready to supply the right answer to even the toughest problem.

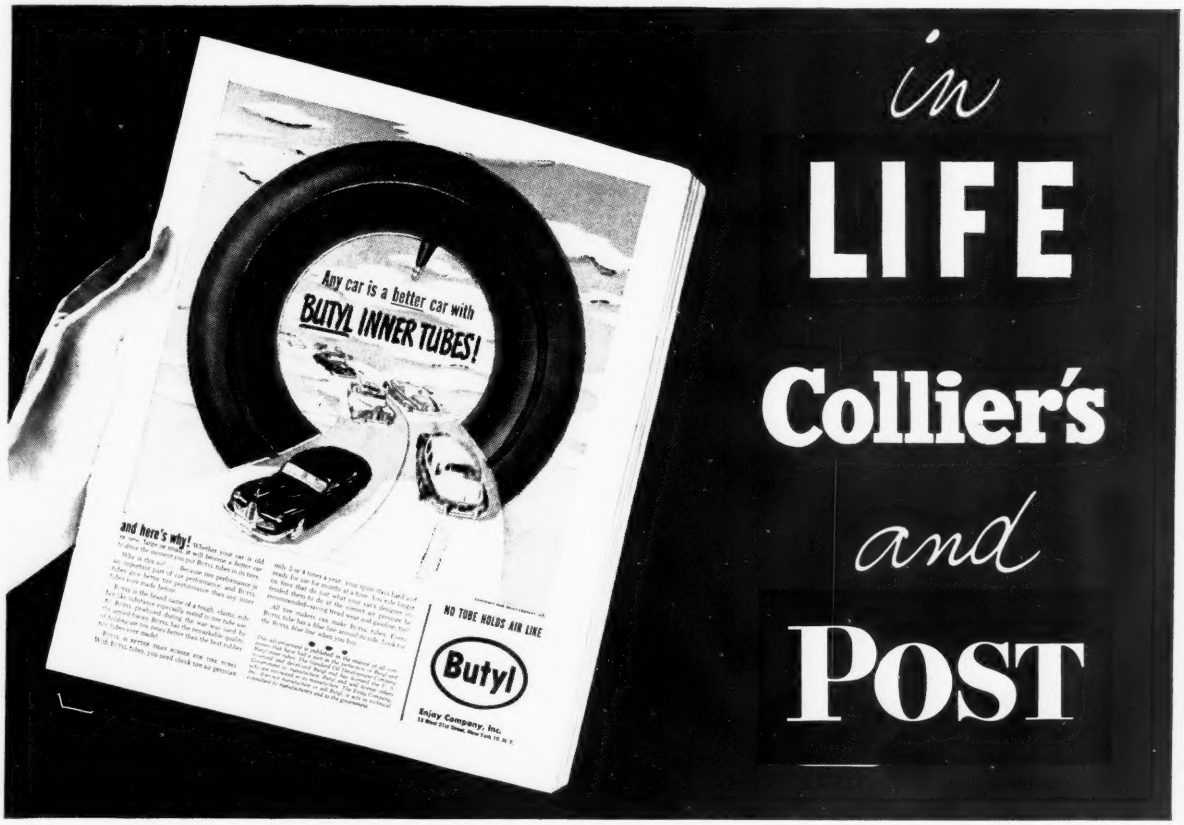
Write for full information today . . . ask for your copy of "Adhesive Facts."

BB CHEMICAL COMPANY, CAMBRIDGE, MASS.

"Whatever It Is BOND IT WITH BOSTIK"

Customized Adhesives

MILLIONS LEARN ABOUT BUTYL...



MANUFACTURERS AND MARKETERS have known for several years that Butyl is superior to natural rubber for inner tubes. BUT NOW for the first time, starting with full-page color ads in January 5th issue of LIFE, January 17th SATURDAY EVENING POST, and February 7th in COLLIER'S . . . the motoring public will be told about Butyl!

Fact-packed, strong-selling national Butyl advertising in 1948 will increase consumer demand for more of *your brand* of tubes... *if you identify them as genuine Butyls!*

The public will learn that Butyl tubes:

- **Hold air ten times better than rubber.**
- **Provide greater safety against blowouts.**
- **Give greater riding comfort.**
- **Save gasoline and tires.**

Watch for the big Butyl ads . . . and be sure to cash in on the FACTS ABOUT BUTYL with your dealers and their customers. For more information about Butyl, and Butyl inner tubes, write

Butyl

TRADEMARK

ENJAY COMPANY, INC.
15 West 51st Street
New York 19, N. Y.

Technical Bulletin No. 40 on the Compounding of GR-S with Substantial Loadings of ZINC OXIDE

Blends of Natural Rubber and X-141

(The Isoprene/Styrene Polymer)

with 100 Parts of Zinc Oxide

(Refer to Technical Bulletins Nos. 24, 25, 27, 34 and 38)

COMPOUND 40	
Smoked Sheet	100.0
Sulfur	3.0
MBT	1.0
"Agerite" Powder	1.0
ZINC OXIDE	100.0

COMPOUND 40A	
X-141	100.0
Sulfur	3.5
MBT	2.0
Coumarone-indene Resin	3.0
E.L.C. Magnesia	5.0
ZINC OXIDE	100.0

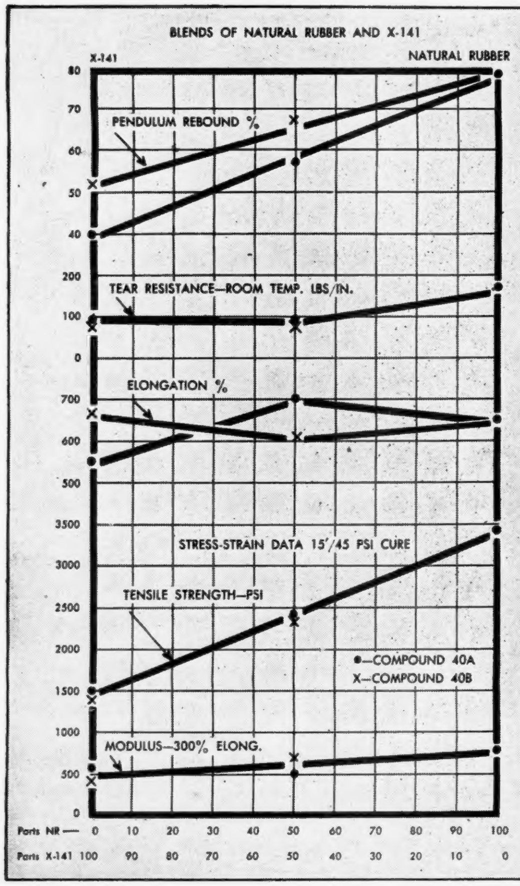
COMPOUND 40B	
X-141	100.0
Sulfur	2.50
"2MT"	0.75
"808"	0.15
ZINC OXIDE	100.0

NOTE: Polymer X-141 is available at this time only in pilot plant lots (as polymer XP-65). Requests for samples should be directed to Research and Development Division of the Office of Rubber Reserve.

IN Technical Bulletin No. 38 certain compounding changes were suggested which seemed to offer possibilities of improving the results of the blends with Zinc Oxide. The effect of these changes are reported in this bulletin.

First, the stearic acid was eliminated from the natural rubber compound, since the X-141 already contains an excess of acidic material, and the coumarone-indene resin content was reduced to 3 parts in the X-141 compound (see 40A). These changes resulted in: (1) Increased curing rate for both the natural rubber and blended compounds; (2) Increased modulus at 300% elongation, with corresponding lowering of the elongation; (3) Lowered pendulum rebound, 5% in the case of the natural rubber compound and 3.5% in the 50/50 blend.

Secondly, coumarone-indene resin and E.L.C. magnesia were eliminated from the X-141 compound (see 40B). "2MT"—"808" is the only accelerator combination for GR-S and modifications which we have found to give good results with Zinc Oxide, over a range of cures, in the absence of E.L.C. magnesia and coumarone-indene resin. The results were as follows: considerably higher modulus, lower permanent set, and an improvement in resilience for the 50/50 blend of the order of 7%.



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THE NEW JERSEY ZINC COMPANY

160 FRONT STREET • NEW YORK 7, N. Y.

Products Distributed by THE NEW JERSEY ZINC SALES COMPANY

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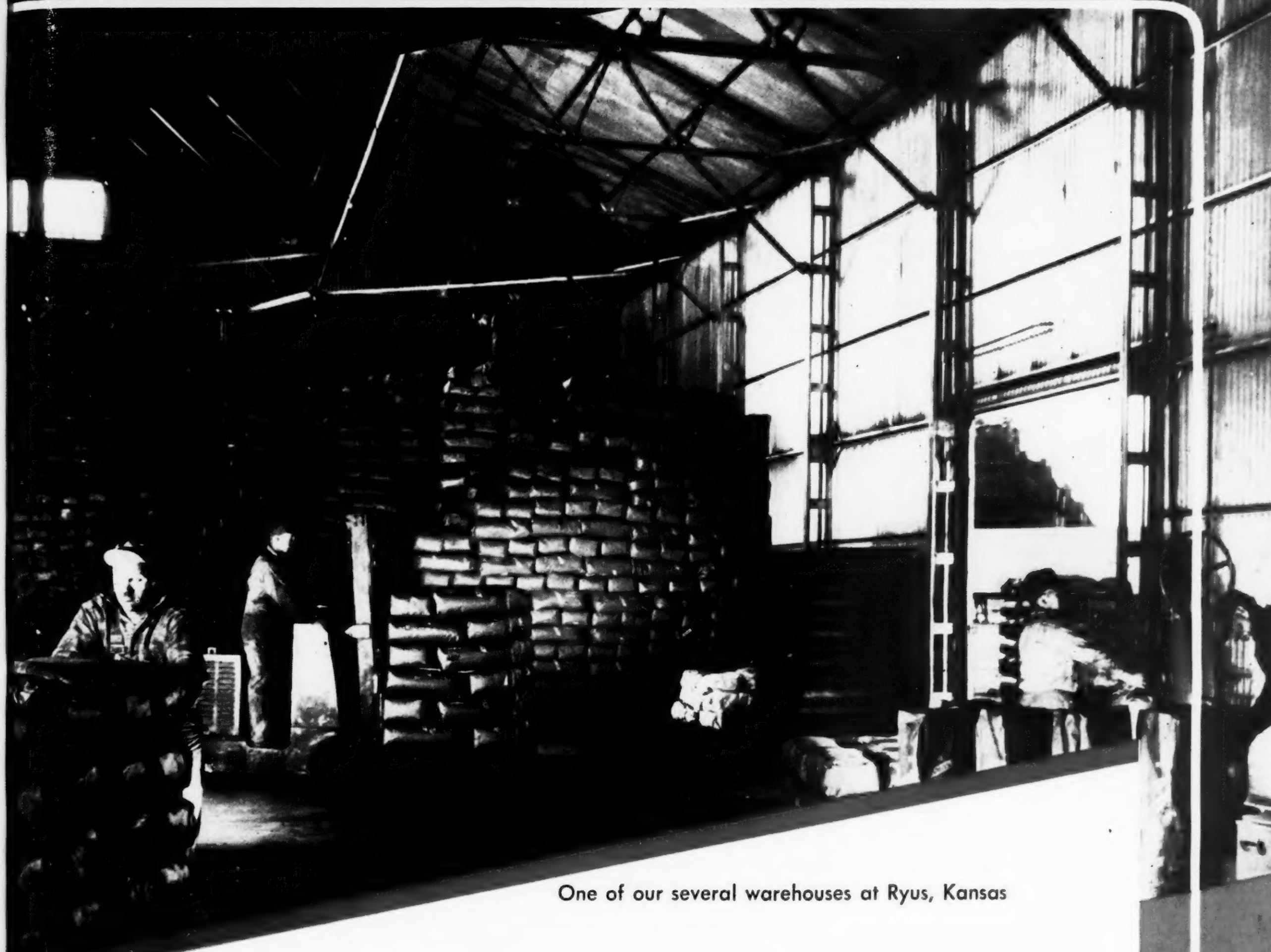


One of our several warehouses at Ryus, Kansas

Producing the highest type carbon blacks is United's main purpose, but United's service to its customers is just as important. This program of service includes packaging so that no time is lost in either handling or identification of contents. On the reverse side of this page, you will note the distinct printing of the bags:

SRF blacks packed in black bags printed in RED.

HMF blacks packed in black bags printed in GREEN.

United's service and United's blacks are designed for your needs.

UNITED CARBON COMPANY, INC.

CHARLESTON 27, W. VA.

NEW YORK • AKRON • CHICAGO • BOSTON

DESIGNED FOR HANDLING

UNITED BAGS claim attention everywhere with their distinctive colored markings. Each type—SRF, HMF, EPC—is the answer for the exacting compounder and is acclaimed for performance in the millroom and on the road. Standardize on UNITED BLACKS to attain perfection in rubber products.

RESEARCH DIVISION

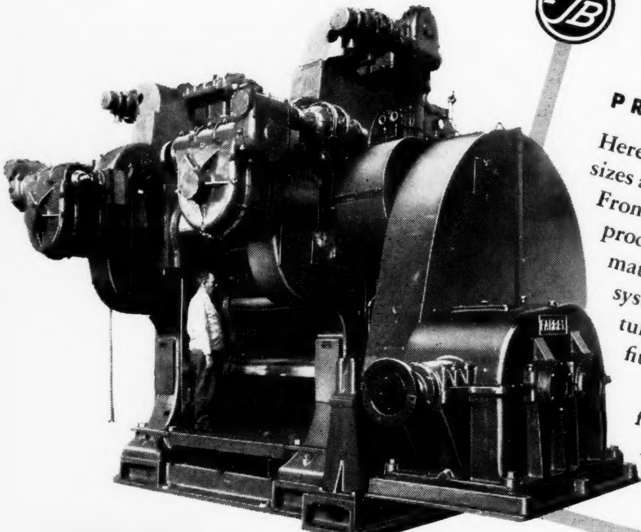
UNITED CARBON COMPANY, INC.

Charleston 27, West Virginia

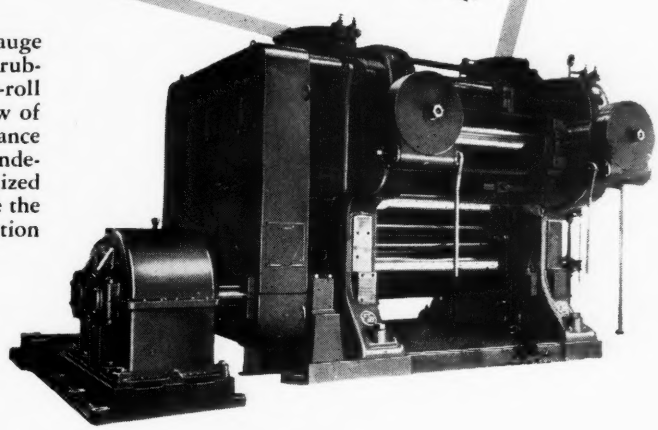
CALENDERS
FOR YOUR PRODUCTION REQUIREMENTS

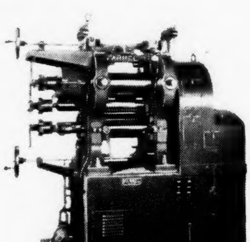
Here are three illustrations of the wide range of sizes and types of Farrel-Birmingham calenders. From the small laboratory units to the huge production sizes, the physical proportions, materials, type of construction, lubricating systems, gearing, special operating features — in fact, every detail is designed to fit the job the calender is built to do.

When you are in need of a calender for a specific application, ask Farrel-Birmingham engineers for recommendations.



LARGE Built for close control of gauge in double coating and multi-pass sheeting of rubber and plastics products, this 32″ x 70″ four-roll calender has individual motors for each screw of the top, bottom and side rolls. This latest advance in roll adjustment mechanism provides for independent movement of the roll ends or synchronized movement for parallel adjustment to facilitate the most accurate gauge control without production interruption.





SMALL Designed primarily for laboratory use but suited also to small production, this self-contained calender is adapted to the processing of a variety of sheet plastics. It is equipped with four 8″ x 16″ chilled iron rolls and a forged steel embossing roll. With the motor and drive enclosed in the high base, a minimum of floor space is required.

MEDIUM This calender was designed for producing light gauge plastic film at high speed and high temperature. It has four 24″ x 66″ rolls which are accurately bored to provide for maximum temperature control. Top and bottom rolls are adjusted by special gearmotor operating through a high ratio reduction unit to the adjusting screws. Either end of a roll can be adjusted separately or both ends together with operation by clutch and push-button. Side roll adjustment is hand operated.

F-B PRODUCTION UNITS Banbury Mixers • Plasticators Pelletizers • Mixing, Grinding, Warming, and Sheeting Mills • Bale Cutters • Tubing Machines • Refiners • Crackers • Washers Calenders • Hose Machines • Hydraulic Presses and other equipment for processing rubber and plastic materials.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston.

FB-411

Farrel-Birmingham

1 Low Evaporation Losses—Skellysolve is free of excessively volatile compounds; fire hazards are reduced.

2 Low End Points, No Greasy Residues—Result in important savings of steam, time and labor; help promote a final product of highest quality.

3 No Unsaturated Compounds—Reduce contaminations and "gum-forming" tendencies.

4 Purity—Skellysolve consists essentially of paraffin or saturated type compounds . . . assures complete stability, even under adverse conditions and repeated use.

5 Close Boiling Ranges—Skellysolve does not suffer fractional distillation. Its composition tends to remain constant during use.

6 Odorless, Tasteless—Skellysolve gives freedom from foreign tastes and odors. This is a major advantage in plants where naphtha odor or taste would be ruinous.

7 Economy—These six points naturally result in greater efficiency, and therefore in greater operating economy.

The 8th Reason for Using SKELLYSOLVE...

DEPENDABILITY

...both in quality and supply is a mighty important factor in your operations

"DOC" MacGEE SAYS: *The 8th reason* for using Skellysolve is its dependability. This means dependability in quality and dependability in supply. Skelly is a leading specialist in the manufacture of naphthas of extra quality for industry. As you know, Skellysolve has been the "standard" of industry ever since Skelly pioneered the large scale production of hexane, heptane, and octane type naphthas from natural gas in 1930.

Equally important is the fact that these solvents *never* vary in quality. And our sources of supply are so large that you need never fear an order will not be *promptly filled*, year in and year out.

Some plants have had unfortunate experiences with "cut-price" sources of supply, and know the value of Skelly dependability in quality, delivery, and technical service.

If you use industrial naphthas in your operations, write today for complete information about Skellysolve. There is one to fit your particular needs.

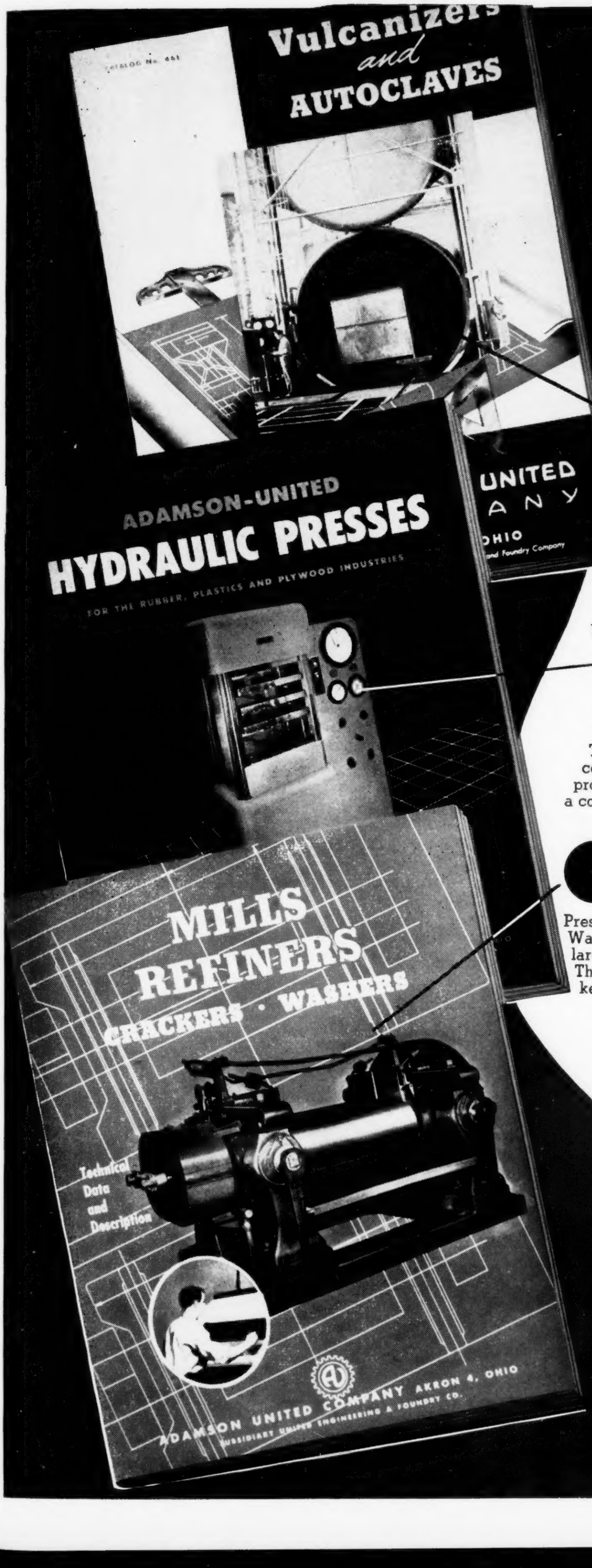
Skelly's plant equipment is modern in every respect

Skellysolve is shipped in tank cars used for no other purpose. There is no chance for contamination or mixture with lead compounds or other materials.

SKELLY

Skellysolve

SOLVENTS DIVISION, SKELLY OIL COMPANY, KANSAS CITY, MISSOURI



We'd like
to give you
these Three Booklets

Vulcanizers and Autoclaves

Illustrates and describes the principal types of vulcanizers and autoclaves developed and manufactured by Adamson United and successfully used by leading rubber companies here and abroad. Whether for present information or as a source of future reference, this new catalog will prove valuable for the information it contains and as an outline of Adamson United vulcanizing equipment.

Hydraulic Presses

The various types of presses successfully used by the country's largest manufacturers of rubber and plastics products are described and illustrated. A letter requesting a copy places you under no obligation.

Mills, Refiners, Crackers, Washers

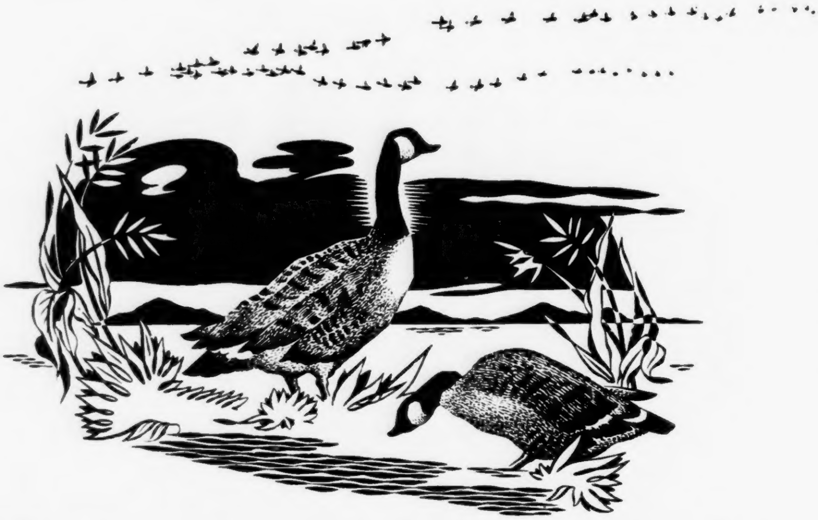
Presents a wide range of modern Mills, Refiners, Crackers and Washers we have designed and built for some of the world's largest manufacturers and processers of rubber and plastics. The text is carefully compiled information you will want to keep in your files for reference.

Send for them Today!

ADAMSON UNITED COMPANY engineers will gladly cooperate with you on all your technical problems and supply all possible data and information. Our abilities, experience and extensive manufacturing facilities are at the service of the industry.

ADAMSON UNITED COMPANY
AKRON, OHIO
Subsidiary of United Engineering & Foundry Co.

• PELLETEX • GASTEX • PELLETEX • GASTEX • PELLETEX • GASTEX • PELLETEX • GASTEX • PELLETEX • GASTEX • PELLETEX



How About Migration?

Staining resulting from Migration in black rubber stocks is out of the question when you use Pelletex Extra Clear carbon black.

That is because Pelletex Ex-Clear, a special purpose SRF black in pelletized form, is made under a precise production control specifically engineered to assure the rubber industry a consistently non-staining black. To guarantee its non-staining qualities Pelletex Ex-Clear is produced on a predetermined schedule to meet the most exacting specifications of the rubber manufacturers.

As a result, Pelletex Ex-Clear may be used with entire confidence in proximity to white or colored rubber or other stock. There is no extractable material to migrate, no staining and discoloration.

Non-staining Pelletex Ex-Clear costs no more than other grades of SRF black, and is immediately available in quantity.

Pelletex Ex-Clear is especially recommended for tire sidewalls, refrigerator gaskets, automotive molded and extruded parts, insulated wire, boots and shoes, rubber coated fabrics.

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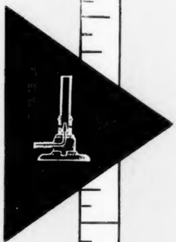


10 melting points

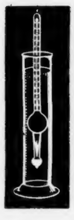
from a liquid

to a brittle solid . . .

available in

PICCOUMARON

a group of Para-Coumarone Indene Synthetic Resins



Piccoumaron Synthetic Resins vary from liquids through viscous liquids and tacky solids, to brittle resins. Colors vary from pale yellow to deep reddish brown. Soluble in coal tar, turpentine, terpene and most chlorinated solvents. Have good resistance to acids, alkalies and salt. For applications requiring close control of melting point, viscosity or color, specific requirements can be met.

Piccoumaron Resins are now available in solid or flake form, and prices are at approximately pre-war levels.

Makers of: Coumarone Resins · Coal Tar Solvents · Styrene Resins · Rubber Plasticizers · Reclaiming Oils Terpene Resins · High Solvency Naphthas · Solvent Oils

PICCO

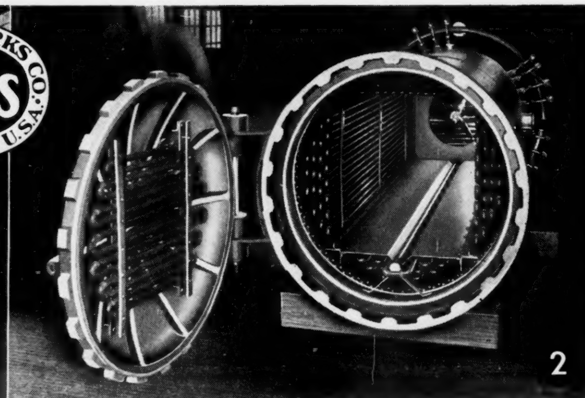
Industrial Chemical Corporation

Clairton, Pennsylvania

Plants at Clairton, Pa. and Chester, Pa.

Distributors to the Rubber Industry

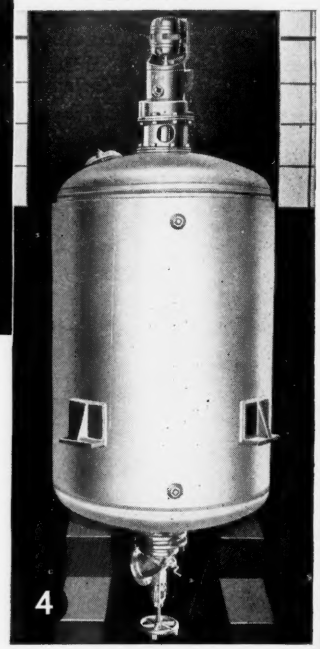
HARWICK STANDARD CHEMICAL CO. · Akron 8, Ohio



Biggs

VULCANIZERS and DEVULCANIZERS Have Served the Rubber Industry for More Than 45 Years

Fig. 1—15-ft. diameter by 45-ft. long horizontal vulcanizer with quick-opening door for vulcanizing rubber linings in large storage tanks. *Fig. 2*—Biggs vulcanizer with special heating manifolds and circulating fan; all sizes, various working pressures.

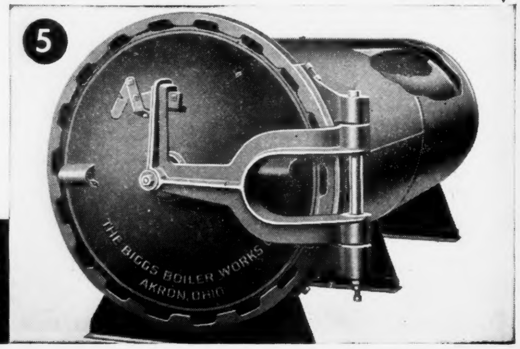


BIGGS-built vulcanizers and devulcanizers have occupied a prominent place in the development of the rubber industry since its inception. For more than 45 years Biggs has furnished single-shell and jacketed vulcanizers both vertical and horizontal, as well as many different types of devulcanizers to meet various requirements of the reclaim experts. . . . It is a far cry from the old days of bolted doors and riveted construction to Biggs modern all-welded units with quick-opening doors. Biggs vulcanizers and devulcanizers are available in all sizes and for various working pressures — with numerous special features. *Write now for our Bulletin 45.*

Fig. 3—vertical vulcanizer with quick-opening door. Door is handled by self-contained arm and gear-operating mechanism. Hand or motor operation.

Fig. 4—high pressure heavy duty jacketed vertical devulcanizer with special agitator. Furnished in various sizes.

Fig. 5—horizontal steam-jacketed vulcanizer with hinge type quick-opening door; all sizes, for various working pressures. Welded construction throughout.



BIGGS WELD · EST. 1887

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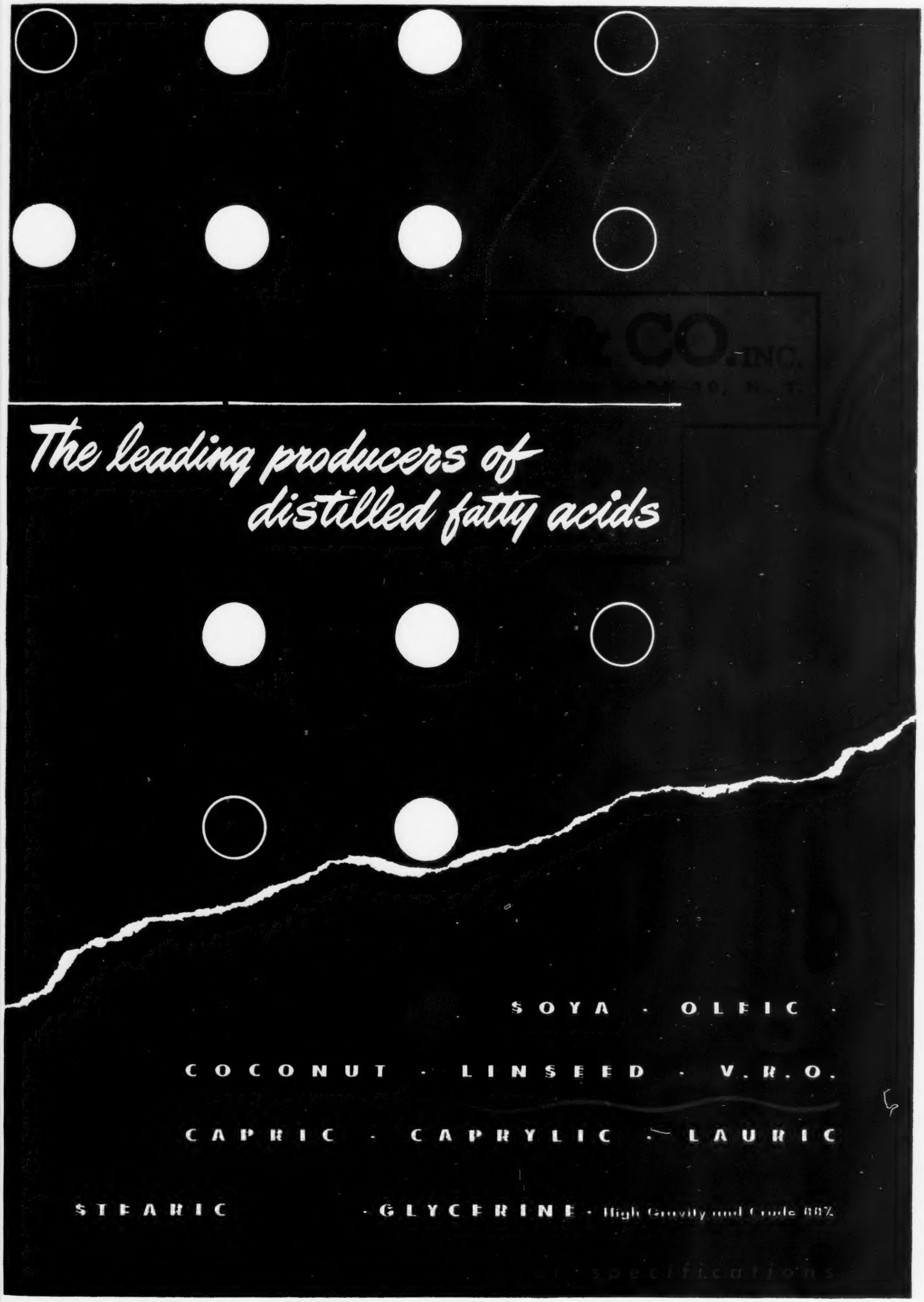

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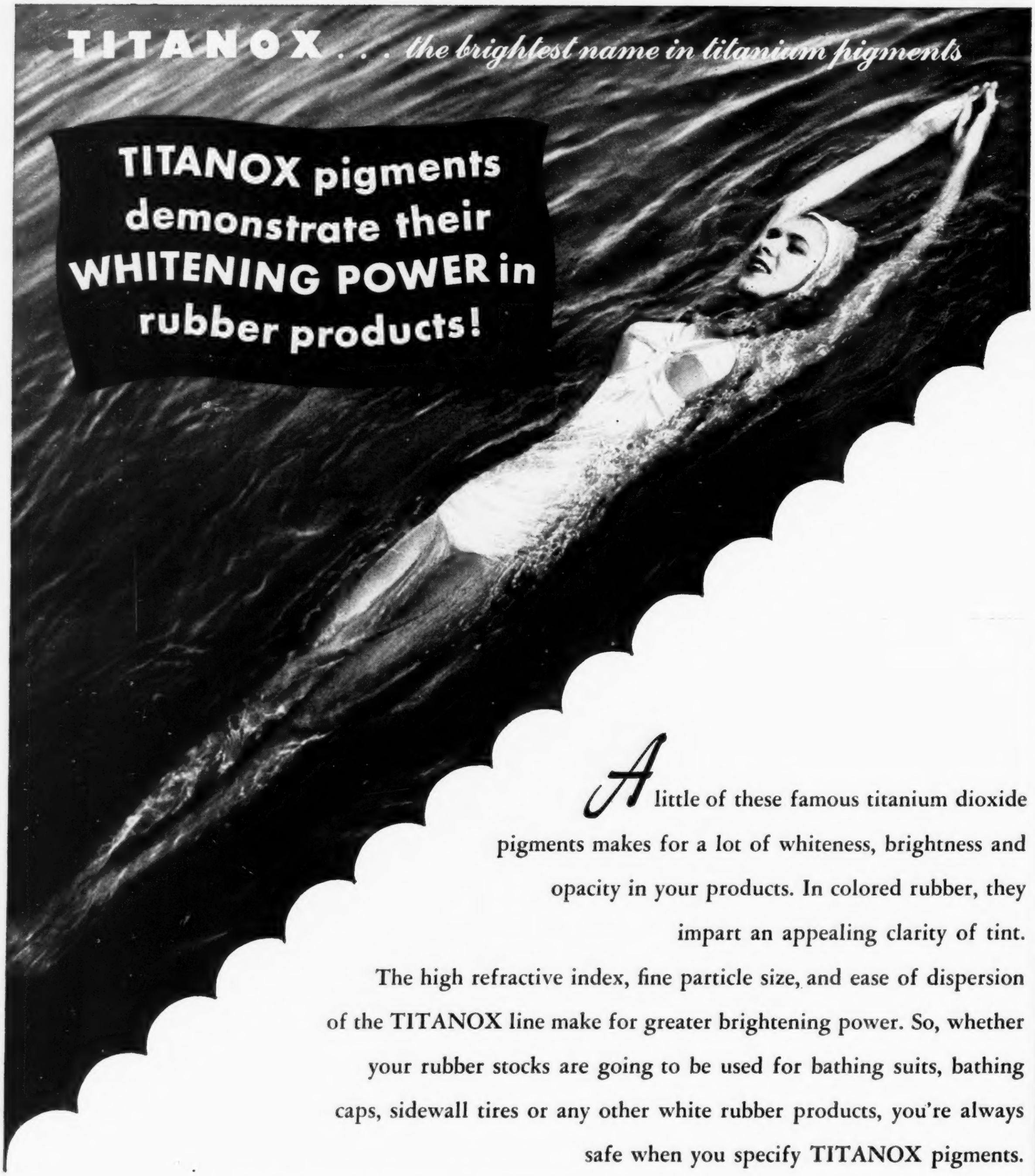

A little of these famous titanium dioxide pigments makes for a lot of whiteness, brightness and opacity in your products. In colored rubber, they impart an appealing clarity of tint.

The high refractive index, fine particle size, and ease of dispersion of the TITANOX line make for greater brightening power. So, whether your rubber stocks are going to be used for bathing suits, bathing caps, sidewall tires or any other white rubber products, you're always safe when you specify TITANOX pigments.

Our Technical Service Laboratory will be glad to help solve your pigmentation problems. This service is available through our nearest office.

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SOLE SALES AGENT

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Elmes hydraulic presses are fast—perhaps *much faster* than you think—and adjustable, of course, for stroke, pressing force, and travel. *They're economical,* too. Less product spoilage and longer life of molds and dies make already low-cost press operation *even lower* by comparison.

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These versatile, quickly variable hydraulic presses may be individually powered or group-operated. Either way, *"Engineered by Elmes"* means ample, dependable fluid force; simple, convenient control.

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Elmes hydraulic equipment is famous for better work, longer runs, *lower costs.* We'll be glad to give you the whole story in terms of types, sizes, specifications, and prices as related to your own particular job. No obligation.

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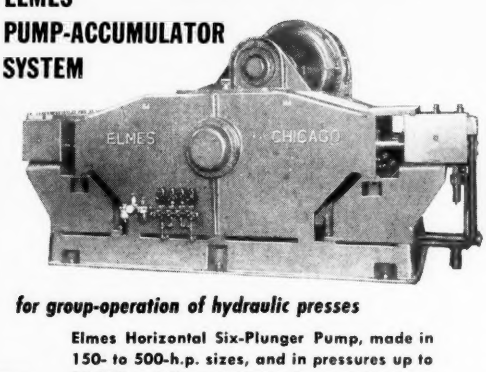
Good Hydraulic Production Equipment Since 1851

ELMES PUMP-ACCUMULATOR SYSTEM



for group-operation of hydraulic presses

Elmes Horizontal Six-Plunger Pump, made in 150- to 500-h.p. sizes, and in pressures up to 35,000 p.s.i. Many exclusive features. Overlapping impulses deliver smooth flow. Also vertical pumps to 100-h.p. Ask for Bulletin 1020.

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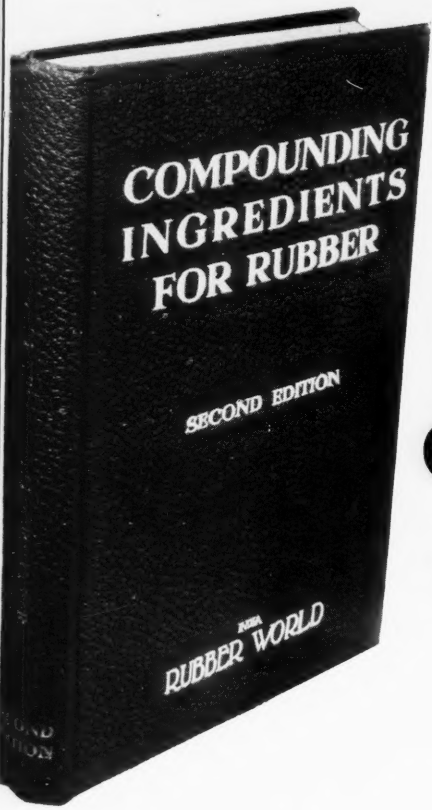

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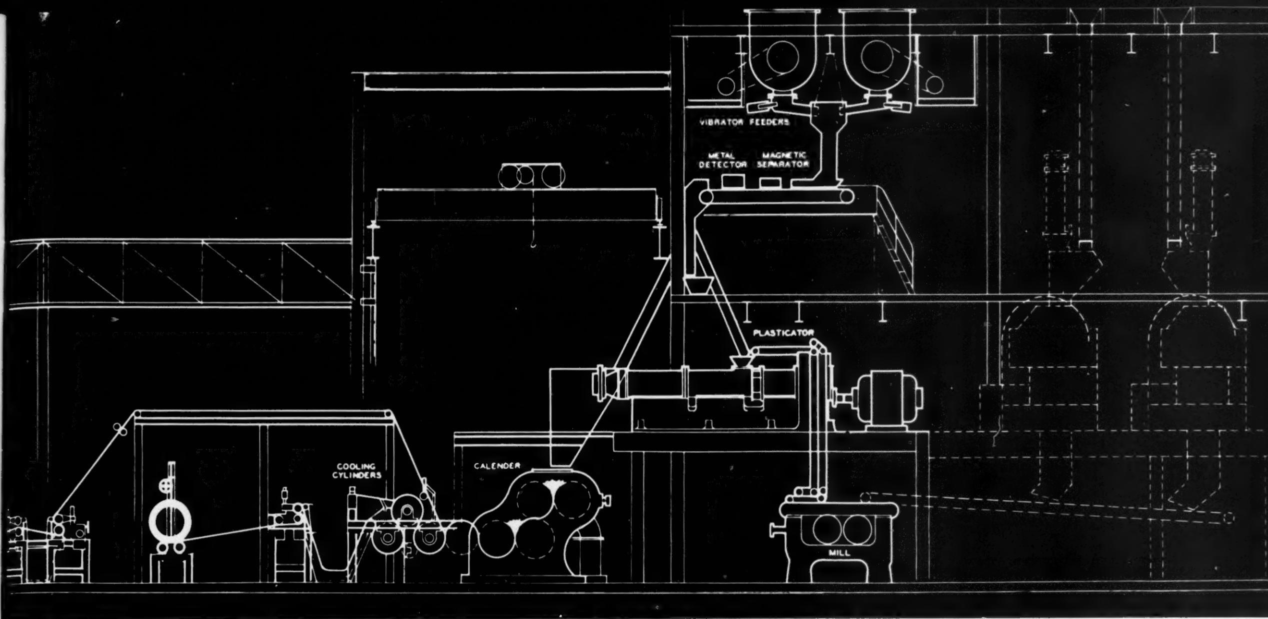

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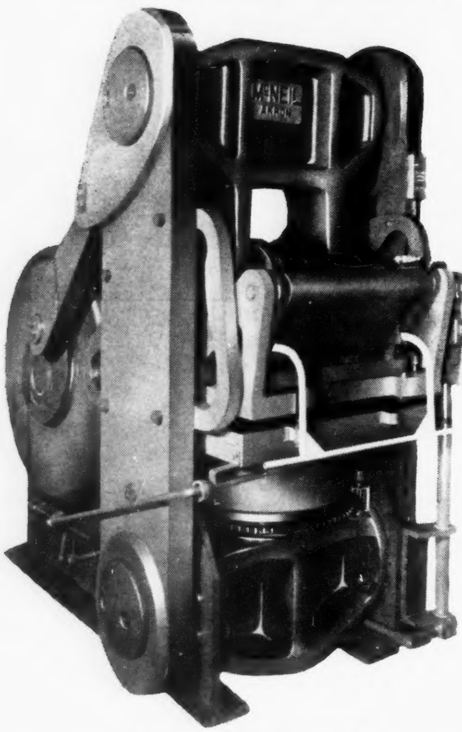
The first of a new line of platen presses



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32x32 DRILLED STEEL STEAM PLATENS.

780 POUNDS PER SQUARE INCH PLATEN PRESSURE.
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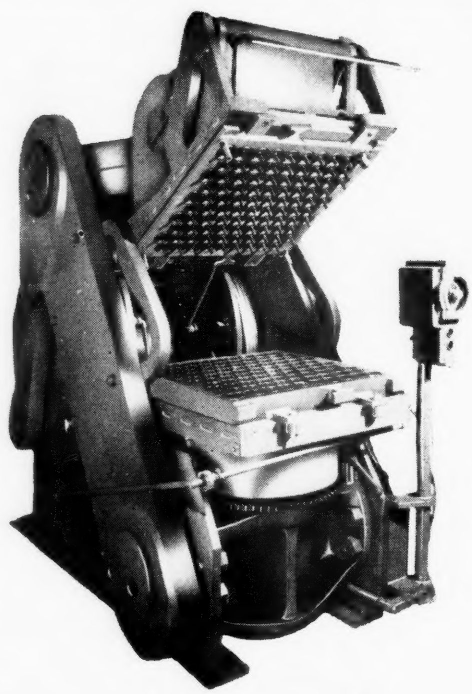

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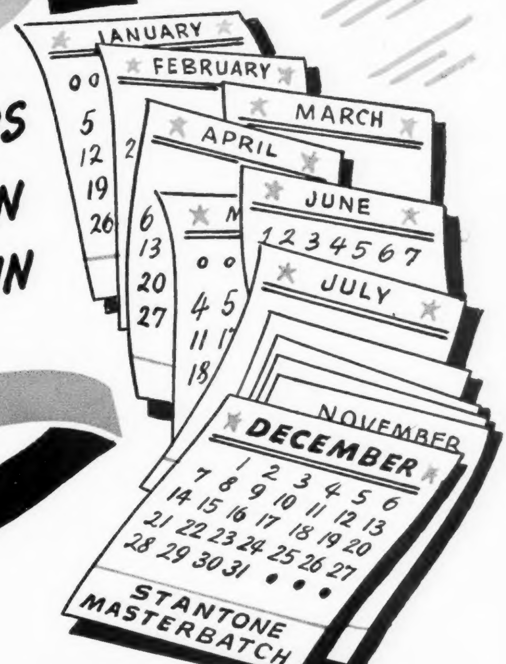

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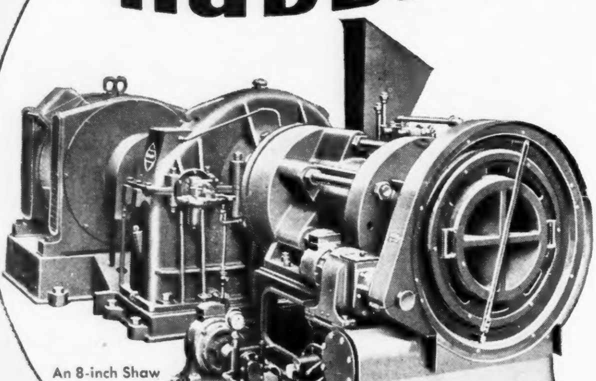

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Check This List of Columbia Pigments Data Sheets . . . Write For Those You Need

No. 47-1—General Compounding Data of Silene EF and GR-S Formulations

No. 47-2—Effect of Ethylene Glycol on Silene EF and Natural Rubber Compositions

No. 47-3—Data on Silene EF in Natural Rubber

No. 47-4—Comparison of Mixtures of Calcene T and Silene EF With Other Fine Calcium Carbonates in GR-S at Medium and High Loadings

No. 47-5—Highly Loaded Silene EF Stocks

No. 47-6—Comparison of Calcene T With Various Calcium Carbonate Pigments in Natural Rubber

No. 47-7—Data on Silene EF and Calcene T in GR-S-10, GR-S-X-141 and GR-S-X-245

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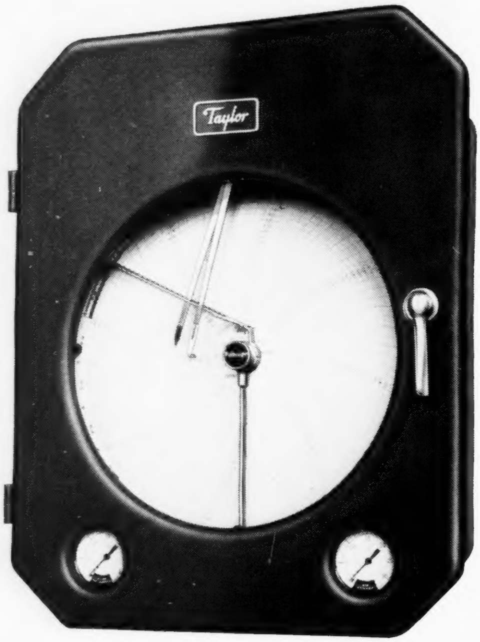
NEW FULSCOPE TEMPERATURE CONTROLLER



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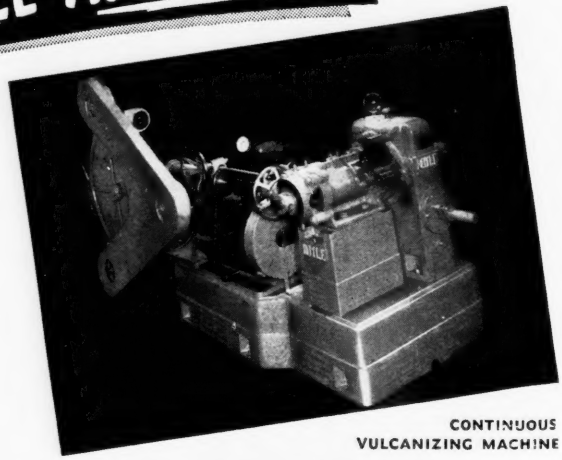

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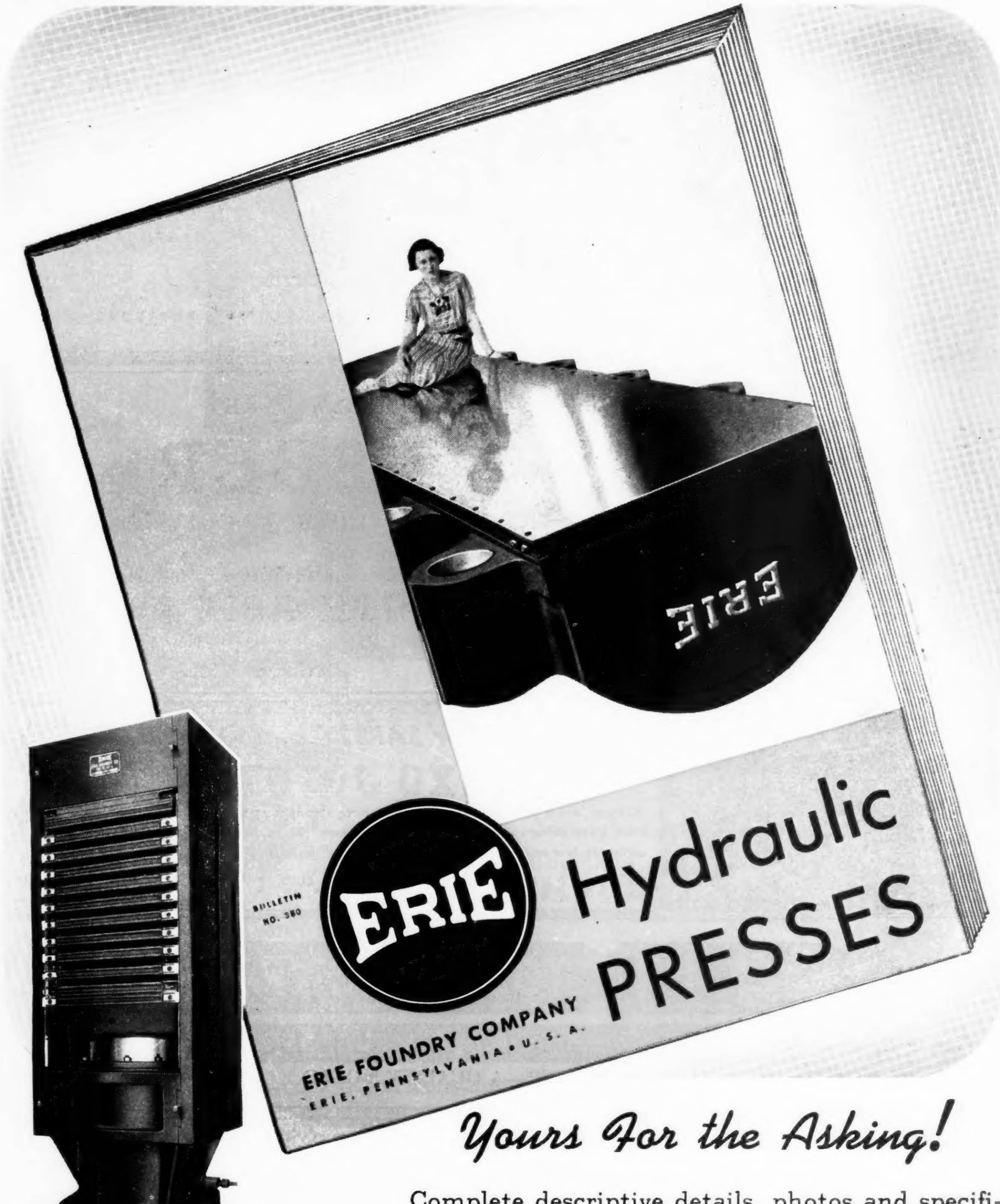

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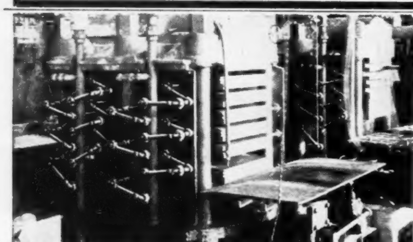

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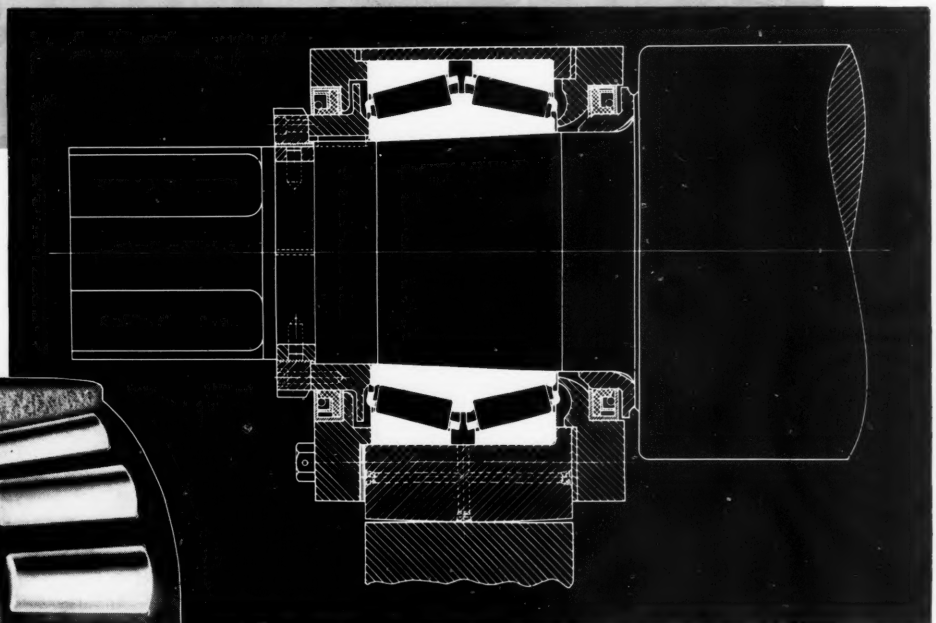

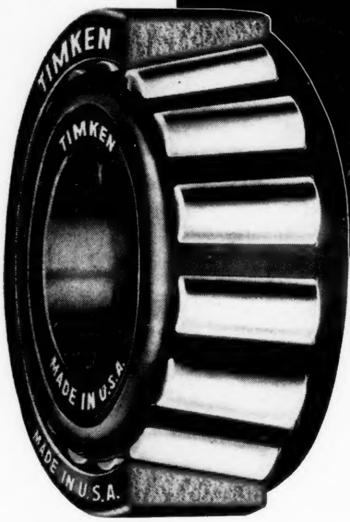

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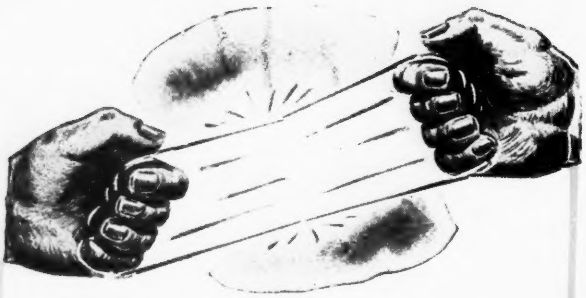

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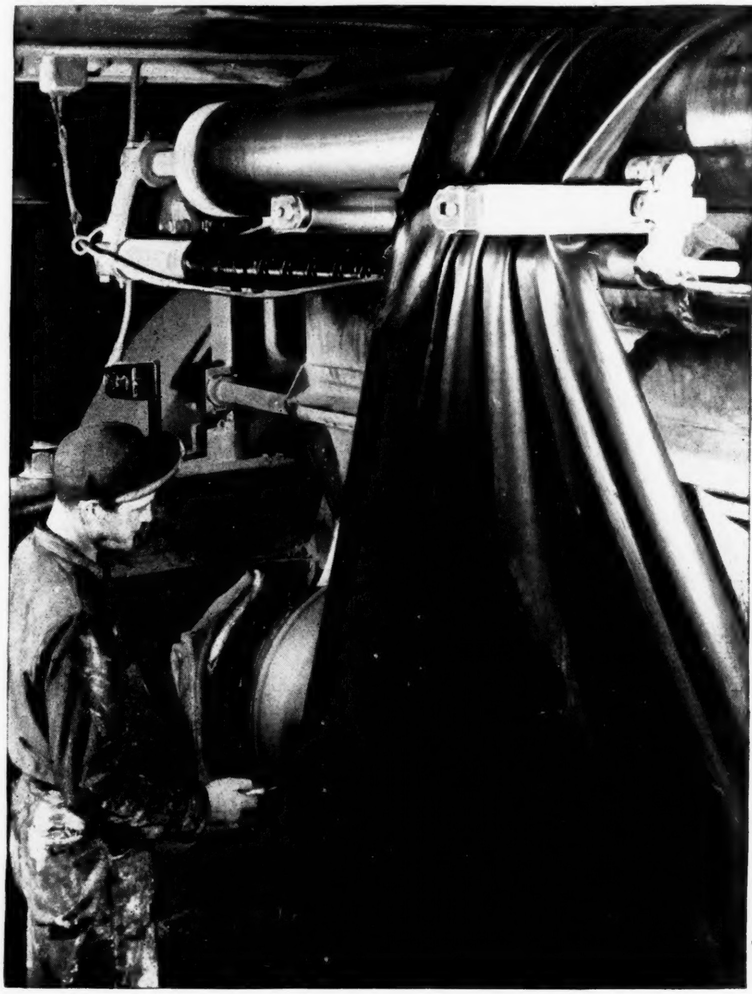

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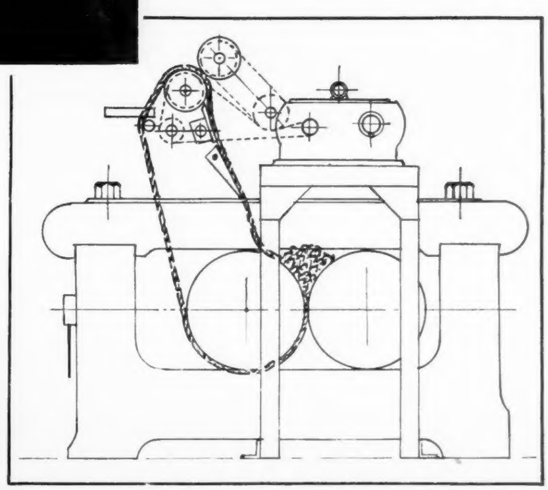

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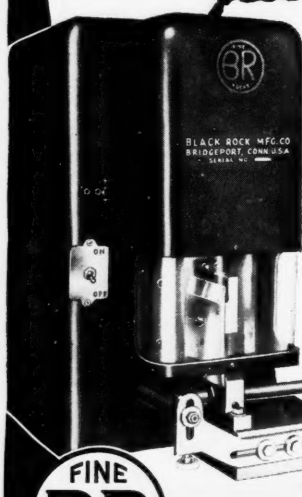

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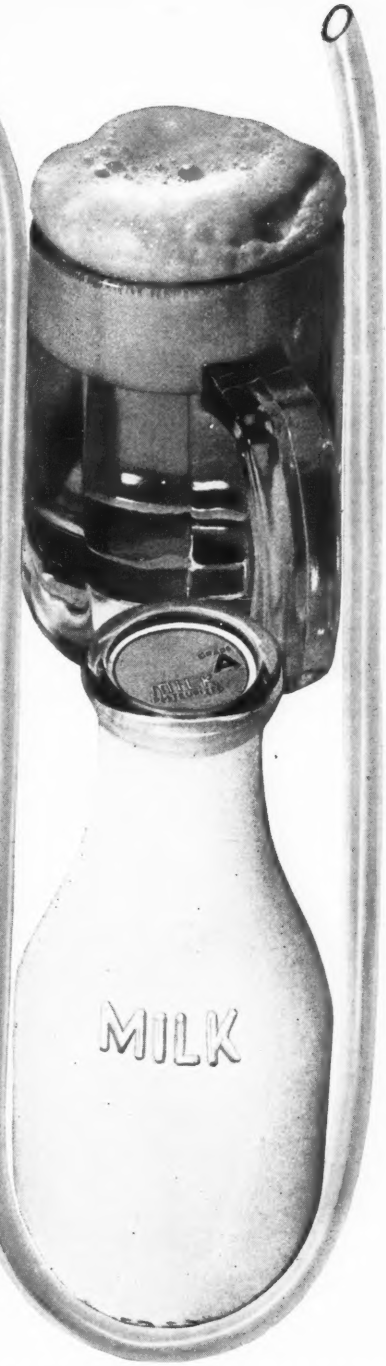

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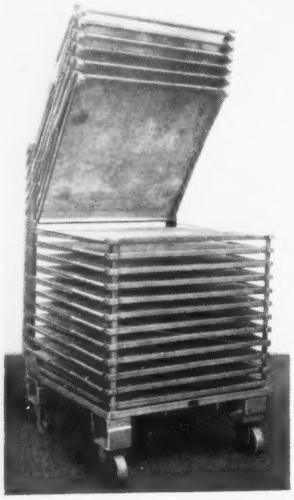

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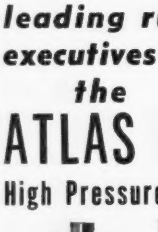

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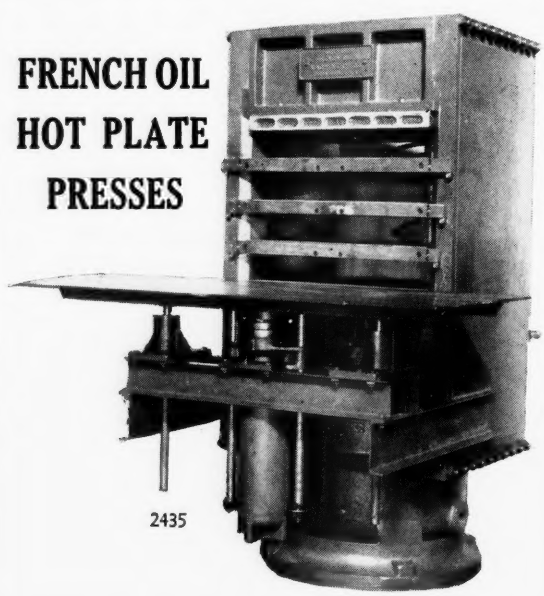

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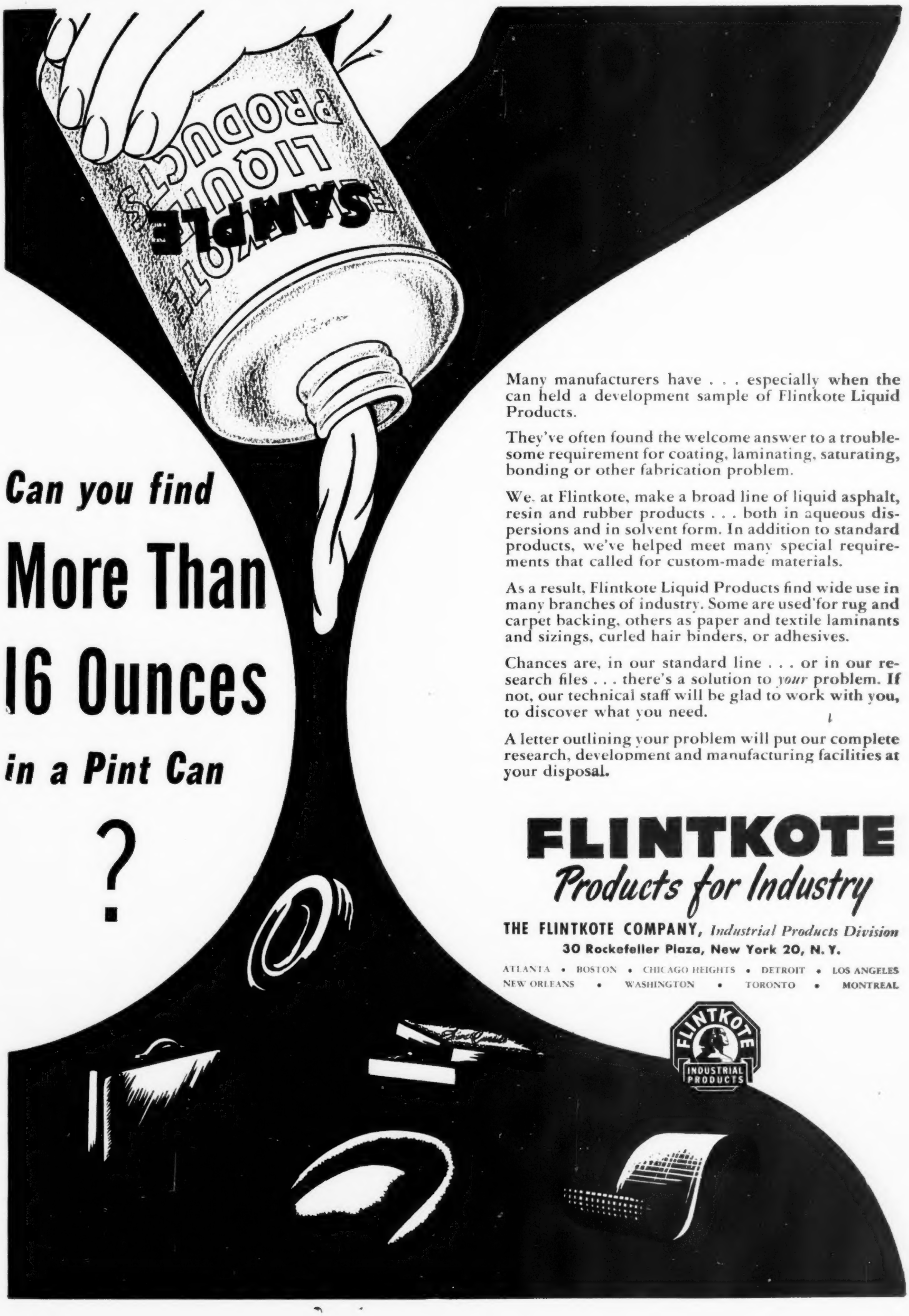
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Volume 117 Number 4

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INDIA
RUBBER WORLD
NATURAL & SYNTHETIC

Volume 117 | New York, January, 1948 | Number 4

Advances in Rubber during 1947[1]

V. A. Cosler[2] and S. W. McCune, III[2]

THE enactment of Public Law No. 24, early in 1947 by the Eightieth Congress, was an important step in the formation of a national policy on rubber. This legislation authorized the continuation of the wartime industry controls until March 1, 1948, so that permanent legislation could be prepared which would establish a long-term policy on rubber as a national security measure (1)[3]. The establishment of a permanent synthetic rubber program has been encouraged by the rubber manufacturing industry (2). The consumption of natural and synthetic rubber continued at a high rate during 1947, and the prospects of the future indicate that this rate of consumption may be continued (3). Free commercial trading was resumed in natural rubber, and increased quantities have been available. In many products the use of natural rubber is unrestricted, and some natural rubber may be used in the manufacture of all types of finished products.

Rubber Production

The development of a new chemical industry, capable of producing synthetic rubber at a rate of 1,000,000 long tons per year, has been described in a review of the governmental activities in the production of synthetic rubber (4).

Improved processes for the preparation of crude rubber have been developed which employ continuous coagulation of *Hevea* latex (5). Research in the development of rubber bearing plants has been continued under government sponsorship (6). A summary has been prepared which describes the properties of the various grades of plantation and wild rubbers (7).

A continuous process has been developed for the isolation of GR-M from latex (8). GR-S polymers may be divided into seven different groups according to their composition and properties (9), and synthetic latices may be classed into four distinctly different types (10).

Research and Development

The vulcanization of rubber with sulfur has been reviewed from a theoretical and practical point of view (11). New studies have been made of the sulfur linkage in vulcanized rubber (12) and the change in properties which rubber undergoes during cure (13). Phenol formaldehyde derivatives have been evaluated as vulcanizing agents for rubber (14). Vulcanization by the Peachey process, involving alternate exposure of specimens of sulfur dioxide and hydrogen sulfide, resulted in good cures of compounds of all types of synthetic rubber with the exception of GR-M (15). The chemical structure of certain organic accelerators was studied in the light of their effect upon rubber vulcanization (16).

The oxidation of rubber has been investigated from a kinetic point of view (17), and new data have been developed on the rate of the rubber-oxygen reaction (18). The factors affecting the aging of vulcanized rubber have been reviewed, and methods of preservation of rubber products developed (19). Measurements of the thermal decomposition of various rubber compositions in air show that exothermic decomposition takes place when compounds are heated rapidly to a temperature of 300° C. (20). An evaluation of the effect of copper on the accelerated aging characteristics of neoprene has led to the development of methods of minimizing its effect (21).

Further support has been given to the theory that the cracking of stretched rubber during outdoor exposure is due to atmospheric ozone (22). Other factors affecting the oxidation of GR-S have also been evaluated (23).

Study of the structure of long-chain polymers, as revealed by X-rays, has been continued by physicists (24).

The electrical conductivity of natural rubber and GR-S compounds containing acetylene carbon blacks has been measured (25). The dielectric properties of mixtures of polystyrene and polybutadiene, as well as other rubber compounds, have been studied (26). The heat conductivity of various rubber compositions has been investigated over a wide temperature range (27).

Permeability of rubber-like materials to gases has been described in terms of the solubility and diffusion of the gas in rubber (28).

Determinations of the swelling of natural and synthetic rubber compounds, when immersed in various organic liquids, have provided valuable comparative data (29). The solubility of unvulcanized rubbers in hydrocarbons is indicative of the effect of solvents on the vulcanized elastomer (30). The effect of various types of carbon blacks upon the swelling properties of different synthetic rubbers has been the subject of several investigations (31).

[1] Paper presented before the Rubber & Plastics Division at the sixty-eighth annual meeting of the American Society of Mechanical Engineers, Atlantic City, N. J., Dec. 4, 1947.
[2] Rubber chemicals division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
[3] Numbers in parentheses refer to the bibliography at the end of the paper.

Synthetic rubbers have been tested for fabric to fabric adhesions (32).

A review of the factors influencing the strength of a rubber-brass bond presented evidence that the bond was a physical one rather than a chemical one (33). Improved methods of bonding rubber to metal have been developed (34).

The rubber reclaiming industry has continued its efforts to improve the properties of reclaimed rubber. Experiments have resulted in the development of a method for estimating the quantity of GR-S in rubber reclaim (35). Studies of the chemical reactions which take place during the reclaiming of rubber have continued (36). New chemicals for the reclaiming of rubber have been developed (37). A comprehensive treatise has been prepared covering the history of reclaimed rubber, methods for its manufacture, its properties and uses (38).

The activities of the National Bureau of Standards in evaluating and testing rubber-like materials have been reviewed. A bibliography lists all the publications by this Bureau on the subject of rubber (39). Methods for the evaluation of small quantities of synthetic polymers have aided the research in the improvement of synthetic rubber (40).

The stability of polychloroprene dispersions and neoprene latices at low temperatures and in the presence of acidic materials has been the subject of considerable research (41).

Polymers of the GR-S type which have low water absorption properties have been developed for use in wire and cable insulation (42).

The importance of fatty acids and their soaps in the manufacture of synthetic rubber has been described (43), and data have been published on the action of hydroquinone as an inhibiter of polymerization (44). New mercaptans have been evaluated as modifiers for GR-S (45).

Methods have been developed for concentrating GR-S latex (46). GR-S polymers have been fractionated, and the physical properties of the various fractions determined (47). The properties of substituted GR-S polymers have also been determined and compared with those of standard compounds (48).

The use of fluorocarbons as dispersing media has made possible the emulsion polymerization of isobuytlene (49).

Additional information has been made available about the properties of Lactoprene, a polymer of ethyl acrylate and chloroethyl vinyl ether, and processes for its manufacture on a semi-commercial scale have been developed (50).

Developments in Rubber

The properties of rubber which are of special interest to engineers include the design factors of elastic materials which are applied to isolate, transmit, or support various loads or forces and the factors involved in the use of rubber in tension (51). The use of rubber parts in springs for commercial vehicles has increased (52).

Reports have been published on the performance of neoprene in experimental tires (53) and on the use of all synthetic rubbers in tires and tubes (54). The use of Butyl inner tubes is claimed to result in increased tire life (55).

The use of synthetic rubber in tires was furthered by an investigation of the frictional properties of tread compounds on ice (56).

Tires containing wire cord reinforcement have been produced on a commercial scale and have proved advantageous in off-the-road service (57). Experimental tires have been built using glass cord fabric as the reinforcement (58).

Heating and drying applications represent successful practical uses for electrically conducting rubber compositions (59).

The factors which influence the backrinding of molded rubber products have been investigated, and suggestions made for minimizing its occurrence (60). Injection molding procedures have been developed for the production of large parts (61), and an improved method has been devised for molding rubber printing plates (62).

An investigation has been made of the frictional properties of oil seal materials (63).

Advances in latex technology have resulted in the development of a wide variety of new applications such as binders and impregnants for fibrous materials, rubber linings and coatings in which synthetic rubber latex compositions have been used (64). The use of rubber linings and coatings for the protection of metal equipment has expanded (65).

Improvements in the properties of high temperature-resistant synthetic compositions have widened their use (66).

Interest has been renewed in the use of rubber compositions as joint fillers for concrete pavement (67).

A method has been developed for the precision machining of rubber parts by freezing them (68).

Testing Improvements

A great deal of information has been published during the year about methods of test.

Improved methods have been described for the chemical analysis of synthetic rubber (69), the determination of the rubber hydrocarbon (70), and the copper content of crude rubber (71).

Procedures for testing rubber in government laboratories have been improved and standardized (72). Greater accuracy has been attained in the stress-strain testing of rubber compounds (73). Statistical analyses of the results of laboratory tests on rubber have thrown new light on the reproducibility of various tests (74). A correlation has been determined between the tensile strength and the brittle point of vulcanized polymers (75). An investigation of the effects which buffing of a tensile specimen had upon the test results led to the development of a new buffing machine (76). Better equipment for the stress-strain testing of rubber has been developed (77).

The effect of the rubber surface on hardness measurements made by a ball indentation method has been reported (78).

A simple cold test for vulcanized polymers measures primary creep at successively lower temperatures by means of a durometer or other hardness tester (79). A new laboratory test for measuring stiffness at low temperature measures the angle of twist produced in a sample by a constant torsional force applied at various temperatures (80). Another method evaluates flexibility at low temperature by stress-strain measurements (81).

The abrasion resistance of rubber has been studied from the point of view of correlation of laboratory measurements with service wear. A survey of a number of tests showed that fair correlation was obtained between laboratory abrasion tests and tire tread performance (82). Extraction of abrasion test samples gave better correlation between laboratory tests and service performance (83). New equipment for abrasion testing has been developed (84). Factors influencing the results of tests for abrasion resistance have been discussed (85).

A study has been made of methods proposed for

measuring tear resistance (86), and procedures for improving the precision of tests for tear resistance have been developed (87).

Testing of rubber for cut growth was reviewed (88). A new method has been devised for measuring the heat embrittlement of natural and synthetic rubber compounds (89). A critical review and discussion of the present knowledge of hysteresis and methods for its measurement in rubber were presented (90), and other studies of the dynamic properties of rubber described the measurement of vibration fatigue (91) and the effect of temperature on resilience and elastic losses (92).

Improved methods have been developed for evaluating the surface cracking characteristics of rubber compositions when exposed to light (93).

Comparisons of the effects of accelerated aging of GR-S and rubber in an oven and oxygen bomb paid particular attention to the effect which temperature and oxygen concentration had upon physical properties (94).

A method of measuring the resistivity of conductive rubber gives results that may be used as an indication of the relative value of compounds in actual service (95).

A measurement of the adhesion of unvulcanized rubber to metal was obtained by observing the angle at which a metal ball rolls off a rubber surface when it is tilted (96).

The velocity and attenuation of sound in rubber strips were measured by the standing wave method (97).

Determination of the rate of plasticization of rubber and GR-S can be made with a Brabender plastograph (98). A Mooney plastometer can be used to determine the provulcanizing characteristics of rubber stocks and the rate at which vulcanization proceeds beyond this point (99).

Standard tests have been developed to evaluate the processability of rubber compounds (100).

Measurements of creep were used as a means of determining the behavior of antioxidants and accelerators in natural rubber and GR-S (101).

Laboratory methods have been developed for the evaluation of rubber torsion springs (102).

Compounding Ingredients

The effectiveness of softeners and plasticizers in GR-S continued to occupy the attention of a number of investigators. One study of the effect of plasticization on the properties of synthetic rubber divided softeners into solvent and non-solvent types (103). A comparison of tire performance with the results of laboratory tests indicated that the latter are useful for selecting softeners for tire compounds, but cannot be used for the precise prediction of their road performance (104). Silicone oils, although incompatible with rubber, are said to increase the resistance to abrasion of vulcanized compounds (105). The cloud points of various coumarone-indene resins have been correlated with their effectiveness as softeners for rubber (106). Low molecular weight polyisobutylenes are reported to plasticize natural rubber and GR-S and to shorten the milling time required for the incorporation of fillers and other ingredients (107).

A variety of materials have been evaluated as plasticizers for nitrile-type synthetic rubbers and blends of them with vinyl resins (108). A graphical method has been suggested for presenting data on the performance of plasticizers in synthetic rubber (109).

Research on carbon blacks and their effect upon the properties of rubber compositions has continued to be important. Several investigations have compared the performance of furnace-type carbon blacks with that of the channel-type blacks (110). The effect of channel carbon blacks on the processing characteristics of synthetic rubber has been evaluated (111). Further studies have been made of the structure of the carbon black particle, its oxygen content, and oxidation characteristics (112).

Copolymer resins containing high proportions of styrene are valuable as reinforcing agents for non-black rubber compositions (113), and water dispersions of these resins may be used in compounding latex (114).

Organic fungicides have little effect upon the properties of natural or synthetic rubber, but organic copper compounds do affect their aging characteristics (115).

Wood cellulose and lignin have been investigated as compounding ingredients for rubber (116), and phenolic resins are reported to improve the oil and heat resistance of synthetic rubber compositions and to increase their tensile strength and hardness (117).

Nitrile-type synthetic rubbers are reported to be effective plasticizers for vinyl resins (118), and several mixtures of these materials are being produced commercially.

Summary

A résumé of the advances made in rubber technology during the year shows that, even with the increased consumption of natural rubber, a considerable proportion of the research and development effort of the rubber industry has been directed toward improving the properties of synthetic rubber products. There have been an increased interest in the testing of rubber products and a noticeable trend toward the experimental evaluation of finished products under simulated service conditions (119). Thorough determinations of the properties of new polymers and compounds have revealed characteristics in synthetic rubber compositions which make them better suited to certain applications than products made from natural rubber (120).

These developments have gone a long way toward overcoming the original prejudice against synthetic rubber products as temporary substitutes and have resulted in their acceptance by users on the basis of their merits.

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[4]Abstract only.

Italian Plastics Industry Active

A survey of the Italian chemical industry indicates that war damage to plants was not so heavy as might have been supposed. Indeed progress here has reportedly been delayed more by the fact that basic materials are lacking rather than by the destruction of facilities.

In the production of synthetic resin and plastics sufficient headway has been made so as to permit estimates of 1947 output at 18,000 tons, of which one-third is said to be destined for export. Before the war Italy was among the important exporters of such synthetic products, and now it is apparently attempting to capture the markets in Europe and South America formerly served by Germany.

The number of synthetic resin and plastic works now existing in Italy is said to be about 820, or double the 1939 figure. The great Montecatini mining and chemical company, which dominates the chemical industry in Italy, is also the most important producer of the synthetic products named. The company, now working with German patents, controls the Cesaro Maderno firm located near Milan and the big experimental plant at Novara, which is reported to be the biggest center of Italian plastic production.

A new factory is to be set up at Terni.

It is also learned that a large pilot-plant for the manufacture of synthetic resins is being built at Porto Marghera, by the Fiat Co.

Contributions of Organic Chemistry to the War Effort—Synthetic Rubber—III[1]

R. F. Dunbrook[2]

THIS installment, the third of several to come, continues from our December issue the article by the former head of the Copolymer Research Branch of the Office of Rubber Reserve, which reviews the government research program on synthetic rubber from the viewpoint of the organic chemist.

Use of Rosin Soaps as Emulsifiers

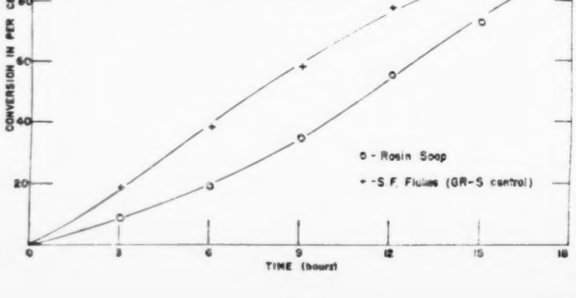
The large amounts of soap required in the synthetic rubber program naturally turned attention to other emulsifiers which might be used (38).[3] Rosin soaps suggested themselves because of their availability, low cost, and the possibility of giving an improved rubber. Soaps prepared from commercial rosin were, however, found to be impractical since they contained phenolic inhibiters and acids of the abietic type which seriously retard the rate of polymerization. Abietic acid contains a conjugated double-bond system which is probably responsible for its retarding effect.

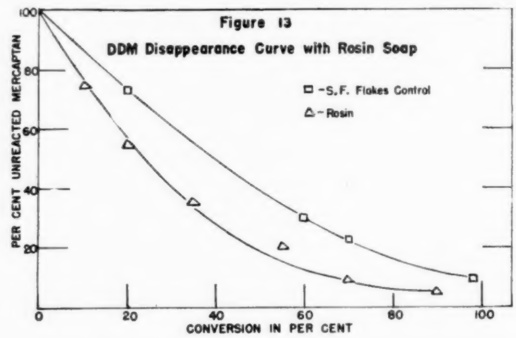
Hercules Powder Co. (39) developed a rosin soap known as "disproportionated rosin soap" or "dehydrogenated rosin soap." A large amount of work was carried out by Hercules in conjunction with the university laboratories and the rubber companies to determine the types of impurities present in dehydrogenated rosin which cause an increased time of polymerization (40, 41, 42). The so-called "dehydrogenation" is in reality a hydrogen exchange reaction whereby a portion of the abietic acid, pimaric acid, and other components of rosin are dehydrogenated to aromatic ring compounds while the remainder of the abietic acid is simultaneously hydrogenated to di- and tetrahydroabietic acids.

Dehydrogenated wood rosin contains about 50% of dehydroabietic acid, together with smaller amounts of dihydroabietic and tetrahydroabietic acids. None of these compounds is detrimental to the rate of polymerization. In addition, neutral bodies are present which merely act as diluents and are not inhibiters of polymerization. Certain phenolic compounds are powerful inhibiters of polymerization and must be removed by suitable refining processes.

Improved methods of purification of the dehydro-rosin have led to a commercial product which is used in the manufacture of GR-S-10. This synthetic rubber is more tacky than GR-S and is therefore superior for tire building. Besides, GR-S-10 shows improved heat resistance, superior hysteresis properties, and better reinforcement in low black compounds and non-black pigment loadings (43).

[1] Presented before Division of Organic Chemistry, A. C. S., Chicago, Ill., Sept. 11, 1946.
[2] Office of Rubber Reserve, RFC, Washington, D. C. Present address, Firestone Tire & Rubber Co., Akron, O.
[3] Bibliography references appear at end of this installment.





The experimental work on the use of dehydrogenated rosin soap shows that the rate of polymerization is considerably slower, and considerably more DDM is required to obtain rubber with the same Mooney as GR-S prepared with soap flakes (44). Figure 12 shows the rate of conversion in the GR-S recipe with soap flakes and with rosin soap. The time to reach a given conversion is much greater with the rosin soap.

In Figure 13 are shown the DDM disappearance curves with rosin soap and soap flakes (44). The modifier is consumed at a faster rate when rosin soap is used as the emulsifier. The greater consumption with rosin soap is in part due to the slower rate of reaction with rosin soap.

From a commercial standpoint the longer time of polymerization and the greater modifier consumption have been overcome by the use of activated recipes. Potassium ferricyanide (41, 45), acrylonitrile (41, 44), and the use of diazothioethers (40) have been used with success.

Shortstopping Agents

The GR-S polymerization is carried to a conversion of 72%. Since a large percentage of the catalyst and other peroxides is still present at this conversion, polymerization will continue during the stripping operation. This results in a higher conversion and the formation of gel giving a polymer difficult to process and of inferior quality. It therefore becomes necessary to add shortstopping agents which will inhibit further polymerization at the desired conversion. Several hundred organic compounds were evaluated as shortstopping agents in the GR-S recipe in various laboratories and pilot-plants. Hydroquinone was found to be very effective and is used in the GR-S plants in a concentration of 0.05-0.10% on the monomers charged.

Many substances which act as inhibiters at the start of

(*Continued on page 552*)

High Styrene Copolymers in Natural Rubber Compounds[1]

Karl M. Fox[2]

THE use of organic resins for compounding natural and synthetic rubbers is a major development in the production of better rubber products at lower prices. When employed, these resins reduce processing time and trouble, lower manufacturing and material costs, and improve the properties and appearance of the finished products. This paper will outline briefly the work that Dewey & Almy has done in developing high styrene copolymers which are unusual in their compatibility with natural rubber and in their effect in improving such properties as flexibility and resilience in rubber products.

Dewey & Almy has been interested in the manufacture and the use of synthetic rubbers and resins since 1936. For a number of years we have made special rubbers and synthetic resins in our own plant and used them in our own products. We found that other manufacturers also needed special materials of this type and during the last two years have worked with a number of people to develop polymers designed for their particular applications. In this work we have produced more than 100 different special polymers in commercial quantities. A 30/70 butadiene-styrene resin called Darex Copolymer No. 2 was the first of our polymers to be used in rubber compounding. Those which have been of most general interest in this field, however, are known as Darex Copolymer 3 and Darex Copolymer X34. A new one, Darex Copolymer X43 is in the final stages of development. Their styrene content varies from about 70 to 85%, and different modifiers are used in polymerization. For simplicity they will be referred to here as high styrene copolymers or by copolymer number.

Cyclized Rubbers *vs.* Styrene Resins

Two classes of material can be considered as rubber resins. The first class is cyclized and modified natural rubbers which have been available for a number of years. The second class, more recently developed, is the high styrene resins. In rubber compounding, both of these classes combine the effect of plasticizer and of reinforcing filler. They increase the tensile strength, the tear resistance, and the abrasion of compounds in which they are used. As hydrocarbons, they have very good electrical properties. In processing they reduce shrinkage and help produce smooth tubing and calendering.

Recently published papers have pointed out that either class produces satisfactory properties in most GR-S stocks. In natural rubber compounds, however, the cyclized rubbers are usually more efficient than the high styrene resins.

Since it is more economical to polymerize high styrene resins than to cyclize natural or synthetic rubbers, Dewey & Almy research has been concentrated on special polymers. As the result of this work, we have developed high styrene copolymers which have not only the usual plasticizing and reinforcing effects, but also add to rubber-like properties such as flexibility, resilience, and low permanent and compression set. These particular high styrene copolymers have proved to be even more efficient in the compounding of natural rubber than they have been in synthetic rubbers.

Plastic and Elastic Resins

The available materials are of two general types, those which are predominately plastic and a few which are predominately elastic. The first type is brittle at room temperature and soft at processing temperatures. It produces rubber compounds which tend to soften when hot and to become very stiff at low temperatures. Darex Copolymer 2 was of this type, as are most rubber resins. Our research has primarily developed resins of the elastic type. Nos. 3 and X34 are of this second type, and rubber compounds made with these resins are not brittle at temperatures down to —5° F. and soften very little when heated as high as 140° F. When ordinary styrene resin is bent, it shatters, but a thin sheet of X34 will bend double without breaking. No. 3 is also very flexible.

In rubber compounds the choice between 3 and X34 is made primarily on the basis of the processing equipment available. Darex Copolymer 3 is preferred for easy handling on an ordinary rubber mill; while Darex Copolymer X34 has a higher processing temperature and should be used in Banbury mixing. Compounds made with 3 and X34 differ from those made from most other rubber resins by having better flex-cracking resistance and being more flexible at normal and low temperatures. The resins also contribute greatly to tear resistance at normal and high temperatures, to even cure, and to good aging. These desirable effects on properties and processing are in addition to those noted with other rubber resins.

Because of the limited space only a few of the compounds which we have tested can be described here. Of course considerable variation in compound properties can be secured by varying ingredients other than the rubber resin. The effects reported here, however, have been noted in a variety of compounds of different types and can be considered as representative of those obtained with our high styrene copolymers.

Compatibility with Natural Rubber

In 1945, soon after the development of Darex Copolymer 3, it was tested in natural rubber. It was in this early work that the unusual compatibility of this type of copolymer was noted. Formulae and data are shown in Table 1.

TABLE 1. DAREX COPOLYMER 3 IN NATURAL RUBBER

Formula (Mill Mix)

Compound No.			
Smoked Sheet	80	50	100
Darex Copolymer No. 3	20	50	—
Channel Black	46	47.5	46
BRT No. 7	1	2.5	1
Pine Tar Oil	2.4	0.75	2.4
Zinc oxide	5	5	5
Sulphur	2.8	2.5	2.8
Captax	1.1	1.25	1.1
Stearic acid	2.4	0.75	2.4
Properties			
Cure (min. at 280° F.)	50	75	60
Tensile (p.s.i.)	3680	2410	3750
Elongation (%)	570	440	540
300% Modulus (p.s.i.)	1300	1870	1560
Hardness (Shore-10 sec.)	72	90	64
Abrasion Test (ASTM D394-40 Method A)			
Volume loss (cc per HPH)	238	212	279
Resilience Test (Goodyear-Healy Resilometer)			
Restored Energy (%)	48.7	34.6	64.7

[1] Presented before the New York Rubber Group, Oct. 24, 1947.

[2] Organic chemicals division, Dewey & Almy Chemical Co., Cambridge, Mass.

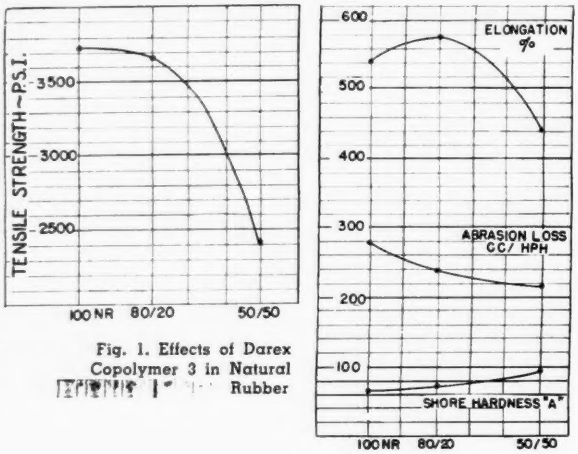


Fig. 1. Effects of Darex Copolymer 3 in Natural Rubber

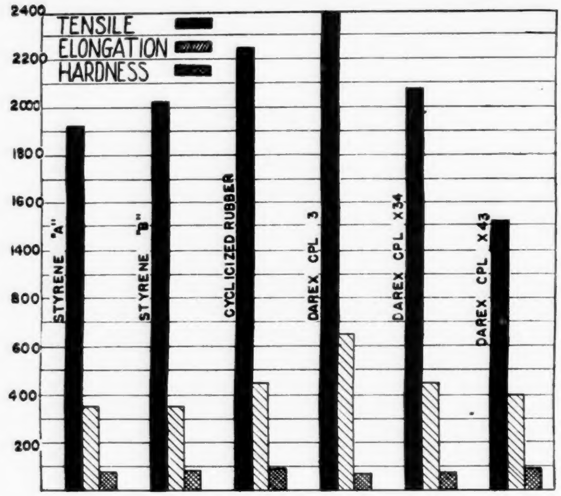


Fig. 2. Properties of Natural Rubber-High Resin Test Compound

In this work the elastomers were plasticized separately on the mill and then blended. The other compounding ingredients were then added in the regular way.

Figure 1 (data from Table 1) shows the effect of Copolymer No. 3 in a natural rubber compound. Increasing amounts of No. 3 increase the hardness and reduce the abrasion loss. Up to 20 parts can be used with little or no change in the high tensile and elongation of the original compound. With 50 parts the tensile and elongation are quite high for such a hard stock. Compounds based on the 50-50 blend of No. 3 and natural rubber have been used in high-quality leather-like shoe soles and in similar products.

Vulcanization of Darex Copolymers as Such

High styrene copolymers can be vulcanized without blending with other rubbers. No. 3 exhibits high tensile strength in such compounds as is shown in Table 2. As is true with natural rubber, higher tensile can be secured by compounding in latex form rather than by mill mixing. With high sulfur a type of ebonite can be made having about 10,000 p.s.i. tensile. The high strength of uncompounded, unvulcanized styrene copolymer resins, as well as the tensile strength of such resins when vulcanized, contributes much to the high quality the resins impart to rubber compounds in which they are used. Stocks with a high percentage of high styrene copolymer are very useful in semi-hard rubber and flexible ebonite products.

Effect on Tensile Properties

To compare different types and classes of rubber resins we used a test formula based on a typical light-colored natural rubber stock. Formula and data are shown in Table 3.

High Resin Natural Rubber Compounds

Figure 2 (data from Table 3) compares the properties of 3, X34 and other resins when used in natural rubber. Included here is Darex Copolymer X43, a new material developed for applications where hardness and stiffness are of primary importance. Tests will be completed soon, and X43 is expected to be available commercially in the near future. The cyclized rubber and Nos. 3 and X34 give highest tensiles and elongations.

TABLE 2. DAREX COPOLYMER 3 COMPOUNDS

Formula A (Mill Mix)	
Darex Copolymer No. 3	100.0
Zinc oxide	5.0
Stearic acid	1.0
EPC black	25.0
Santocure	1.5
Sulfur	2.5
Properties	
Cure (min. at 316° F.)	16
Tensile (p.s.i)	2430
Elongation (%)	280
100% modulus (p.s.i.)	1520
Hardness (Shore A)	92
Tear (lb./in.)	435
Specific gravity	1.17

Formula B (Latex Mix)	
Darex Copolymer* 9L (latex solids)	100
C 404 Dispersion †	8
Setsit 5†	1.5
Cure (min. in 200° F. oven)	60
Tensile (p.s.i.)	3400
Elongation (%)	585
300% modulus	2255
After Aging 25 Hours in 100° C. Oven	
Tensile (p.s.i.)	3400
Elongation (%)	415

*9L is Darex Copolymer 3 in high solids latex form without antioxidant.
†From R. T. Vanderbilt Co.

TABLE 3. DIFFERENT RESINS IN NATURAL RUBBER

Base Formula (Banbury Mix)

Elastomers (as noted)	100.0
Silene EF	40.0
Zinc oxide	6.0
Stearic acid	1.0
Altax	1.5
Butyl zimate	0.15

Compound	1	2	3	4	5	6	7
Natural rubber content	100	70	70	70	70	70	70
Rubber resin content	0	30	30	30	30	30	30
Rubber Resin type	None	Cyclized rubber	Styrene resin	Styrene resin	Darex Copolymer 3	Darex Copolymer X34	Darex Copolymer X43
Properties: Slabs Press Cured 15 Minutes at 305° F.							
Tensile (p.s.i.)	2800	2250	1920	2030	2400	2070	1510
Elongation	650	450	350	350	650	450	400
200% modulus (p.s.i.)	250	930	1160	1120	260	800	1010
Hardness (Shore A)	52	91	84	82	71	74	88
After Aging Four Days at 158° F.							
Tensile (p.s.i.)	3210	2120	1800	1940	2670	2080	1550
Elongation (%)	650	375	250	300	450	425	375
200% modulus (p.s.i.)	280	1190	1480	1300	790	850	1090
Hardness (Shore A)	52	91	84	82	71	74	88

Effect on Flexibility

Darex Copolymers in rubber compounds in comparison with other resins seem to resist better the effect of high temperatures on hardness and low temperatures on stiffness and flexibility. In one case two compounds were made up identical in composition except that in one a Darex Copolymer was used and in the other another styrene resin. At room temperature both had a Shore Hardness of 82, but when tested at 150° F., the hardness of the compound containing the ordinary resin had decreased to 72 while the Darex Copolymer compound still registered a hardness of 81. Selected cured samples of the above compounds were tested for flexibility at room temperature and at —20° F. using a Gurley stiffness tester[3] with results as noted in Table 4.

[3] This instrument measures bending resistance of paper, plastics, and other sheet materials. The measurement is made or the stiffness or pliability of the material and expressed in terms of stiffness index in milligrams for a standard sized sample. See also "Gurley Stiffness Tester," Bulletin 1430, W. & L. E. Gurley, Troy, N. Y. (1947).

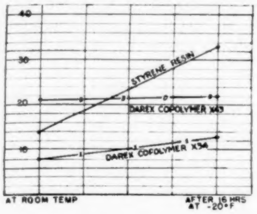


Fig. 3. Flexibility of High Resin-Natural Rubber Compounds—Flexibility at Normal and Low Temperatures (Gurley Stiffness Index)

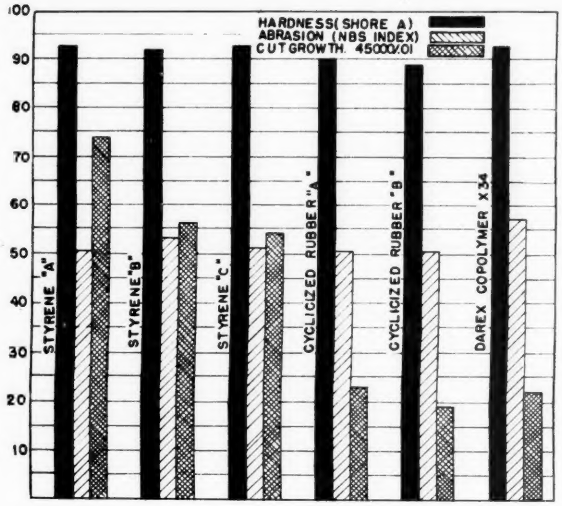


Fig. 4 *(Right)*. Properties of Natural Rubber-Medium Resin Test Compound (Compound A, Table 5)

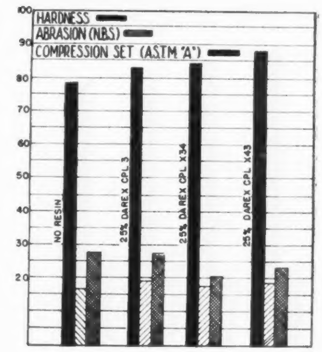


Fig. 5. Properties of Natural Rubber-Low Resin Test Compound

TABLE 4. GURLEY STIFFNESS

Rubber Resin	At Room Temperature	At —20° F after 16 Hours
Styrene Resin	14.2	32.7
Darex Copolymer 3 ..	2.9	4.5
Darex Copolymer X34	8.7	13.0
Darex Copolymer X43	20.99	22.0

TABLE 5. VARIOUS RESINS IN NATURAL RUBBER—HIGH FILLER LOADING

Compound A		Compound B	
Smoked sheets	60.0	Brown crepe	75.0
Rubber resin (50-50 Masterbatch)	40.0	Rubber resin	25.0
AgeRite Stalite	1.5	Stearic acid	1.0
Stearic acid	1.0	AgeRite Stalite	2.0
Cumar resin	10.0	Paraffin	0.5
Silene EF	75.0	Zinc oxide	4.0
Color pigments	2.0	Silene EF	80.0
Sulfur	2.8	Solka floc	5.0
Accelerators	1.2	Altax	1.5
Zinc oxide	8.0	Ethyl zimate	0.1
		Sulfur	2.0

Slabs Press Cured 12 Minutes at 315° F.

Properties: A	1	2	3	4	5	6
Rubber Resin Type	Styrene	Styrene	Darex Copolymer X34	Cyclized Rubber	Styrene	Cyclized Rubber
Hardness (Shore A) ..	93	92	93	90	93	88
Tensile (p.s.i.)	1550	1770	1825	1875	1750	1675
Elongation (%)	400	405	450	480	395	495
Set at break (%)	60	70	70	50	65	50
Abrasion Test—National Bureau of Standards Index						
	50.6	53	56.5	50.8	51.6	50.5
After Aging 24 Hours at 100° C.						
Hardness (Shore A) ..	93	92	92	87	93	87
Tensile (p.s.i.)	1425	1400	1800	1585	1555	2185
Elongation (%)	180	170	235	300	160	380
Ross Flexing Test*—Cut Growth Size after 45,000 Cycles						
Reading in 0.01-inch ..	74	56	22	23	54	19

Properties: B Rubber Resin Type	Darex Copolymer X34	Styrene	Cyclized Rubber
Specific gravity	1.28	1.28	1.27
Hardness (Shore A)	92	89	94
Abrasion (NBS index)	37.5	31.3	45.2
Ross flex (Cycles to failure)	109,000	36,500	156,000

*The Ross rubber flexing test is now a standard test with most of the heel and sole manufacturers. It has replaced the du Pont belt type, the DeMattia grooved strip, and other flexing tests as used for belts, tires, and other products. The Ross test duplicates more closely the deteriorating action which takes place on shoe soles in use. This test is made on sample strips molded or cut to the size one inch by six inches. The thickness should be between ⅛-/and ½-inch. Samples are usually aged 24 hours at 100° C. before testing. Comparisons can be made only between samples of approximately the same thickness and hardness. A 0.1-inch slit, crosswise to the length of the strip, extending completely through the sample, is made with a standard No. 6 chisel point awl at a point about in the center of the strip. One end of the strip is clamped to a flexing plate which operates through an angle of 90 degrees from a horizontal to a vertical position at the rate of about 100 cycles a minute. The free end of the sample is guided horizontally between rollers which allow this end of the strip to move back and forth. The strips are placed in the machine so that flexure occurs at the cross-section where the cut is made. After the machine is started, at regular intervals the cut growth is measured to the nearest 0.05-inch. Ratings can be given according to the cut size after a number of flexures, i.e., if the crack is ½-inch wide after 50,000 flexures, the rating is 5 at 50,000. Complete failure is indicated when the crack has extended across the full one-inch width of the sample. The new flexing test and apparatus were developed by Arthur I. Ross, Panther Panco Rubber Co., Chelsea, Mass. The apparatus is built by the Emerson Apparatus Co., Melrose, Mass.

In Figure 3 is shown the effect of the high styrene resins on the flexibility of compounds as measured by the Gurley tester. At room temperature X34 is quite flexible; while X43 and the typical styrene resins are stiffer. However, after 16 hours at —20° F. the flexibility of the styrene resin compound is markedly reduced; while those of the X34 and X43 have changed very little. Compounds of this type made with X34 are excellent for shoe soles requiring abrasion and flex cracking resistance; while X43 can be used in top-lift slabs and similar harder products.

Effect on Hardness, Abrasion, and Flex Life

The effect of rubber resins in natural rubber compounds with more inorganic pigment was tested in the following formulae, and the data were recorded in Table 5. Fifty-fifty masterbatches of rubber and resin were mixed on a hot mill, and these masterbatches were used in mill mixing of these compounds.

Figure 4 shows the properties of the natural rubber formulae containing a lesser amount of rubber resin. Ross cut growth is measured after 45,000 flexures. Both of the cyclized rubbers produce excellent flex-life in hard stocks with good abrasion resistance. X34 Copolymer in these formulae gives high hardness, superior abrasion index, and excellent flex-cracking resistance. Such formulas can be used to good advantage for high grade shoe soles.

TABLE 6. LOW RESIN—HIGH FILLER LOADING IN NATURAL RUBBER COMPOUNDS

Compound	B1	B2	B3	B4
Smoked sheet	100.00	100.00	100.00	100.00
Darex Copolymer 2	....	25.00	....	....
Darex Copolymer X34	....	....	25.00	....
Darex Copolymer X43	....	....	....	25.00
Reogen	1.00	1.00	1.00	1.00
Stearic acid	1.50	1.50	1.50	1.50
AgeRite Stalite	1.00	1.00	1.00	1.00
Zinc oxide	10.00	10.00	10.00	10.00
Kalite #1	50.00	50.00	50.00	50.00
McNamee Clay	275.00	275.00	275.00	275.00
Sulfur	4.00	4.00	4.00	4.00
Altax	1.50	1.50	1.50	1.50
Methyl zimate	0.15	0.15	0.15	0.15

Stress at 100% (S)—Tensile (T)—% Elongation (E)—Hardness (H)
Original

Press Cures at 307° F.

Min.	B1 S	B1 T	B1 E	B1 H	B2 S	B2 T	B2 E	B2 H	B3 S	B3 T	B3 E	B3 H	B4 S	B4 T	B4 E	B4 H
6 ...	710	770	145	80	670	780	185	83	730	860	165	85	—	750	90	90
8 ...	750	850	155	81	710	760	160	84	740	780	140	84	—	920	90	89
10 ...	800	930	140	79	820	910	160	83	790	890	135	84	—	870	75	88
12 ...	820	940	140	78	800	900	165	82	780	820	120	84	—	910	90	88

Abrasion Test—U. S. Bureau of Standards Index

Min.	B1	B2	B3	B4
10 ...	16.8	19.5	17.7	18.6

Compression Set (A.S.T.M. Method A) — %

Min.	B1	B2	B3	B4
13 ...	27.8	27.5	20.9	23.4

The major effect of high styrene copolymers in compounds with high amounts of pigment loading is to act, in part, as plasticizer and help carry the heavy filler content. They also improve tremendously the finished quality of the compounds. In contrast to the use of regular plasticizers these effects are secured without reducing hardness or increasing the compression set of the stock. In one case the flex-life of a highly loaded sole stock was increased from 7,000 cycles to more than 100,000 by the addition of only five parts of No. 3. The data shown in Table 6 were taken from tests on this type of compound.

Low Resin Natural Rubber Compounds

Figure 5 (data from Table 6) shows the use of relatively small amounts of resin in rubber stocks with high pigment loading. In this type of formula most of the hardness is provided by the inorganic pigment while the high styrene copolymer helps to carry the pigment load. Only 10 to 20 parts of copolymer are needed to make the stock more plastic and allow it to calender and mold more smoothly. In the finished product the use of these copolymers improves abrasion and compression set and gives high gloss without reducing the hardness. For this purpose 3 and X34 as well as other rubber resins can be used more or less interchangeably. Such stocks are excellent for flooring, table edging, table tops, and refrigerator cabinet tops and gaskets.

Effects on Hardness, Abrasion, and Flex Life of Natural Rubber—GR-S Blends

TABLE 7. RESINS IN NATURAL RUBBER—GR-S BLENDS

Base Formula (Mixed in Lab Banbury)

GR-S, Smoked Sheet, and Rubber Resin—Total	100.0
Reogen	4.0
Stearic acid	1.0
Paraffin	1.0
Zinc oxide	3.0
AgeRite Hipar	1.0
Iron oxide	3.0
MPC black	0.4
Altax	1.5
Sulfur	2.0
Silene EF	55.0
Methyl zimate	0.2

Compounds	A	B	C	D
Rubber resin type	None	Darex	Darex	Styrene
Rubber resin Content	None	Copolymer X34 35.0	Copolymer X43 35.0	Resin 35.0
GR-S content	46.4	21.6	21.6	21.6
Smoked sheet content	53.6	43.4	43.4	43.4

Properties: Slab Press Cures at 320° F.

200% Modulus (S) — Tensile (T) — Elongation (E)

Slab Press Cures at 320° F. Original

Min.	A S	A T	A E	B S	B T	B E	C S	C T	C E	D S	D T	D E
6	445	1600	510	740	1380	400	880	1220	450	965	1250	310
8	460	1750	550	750	1370	390	750	1220	360	965	1200	290
10	360	1690	570	750	1350	380	740	1120	340	950	1190	320
12	360	1670	560	750	1350	390	740	1120	380	950	1190	320
15	360	1560	540	740	1280	390	730	1110	350	940	1190	320

Min.	A	B	C	D
Abrasion Test — U. S. Bureau of Standards Index				
12	56	40	34	34
Original Hardness (Shore A)				
10	57	75	85	85
12	54	75	85	87

After Aging 24 Hours in Oven at 100° C.

Ross Flexing (Inches Cut Growth Starting from 0.10 Transverse Cut)

Cycles	A	B	C	D
Cure 10 Min. at 320° F.				
5,000	.10	.10	.28	.25
10,000	.10	.11	.30	.30
25,000	.10	.18	.50	.42
50,000	.10	.24	.61	.52
75,000	.11	.28	.85	.55
Cure 12 Min. at 320° F.				
5,000	.10	.10	.28	.25
10,000	.10	.13	.33	.30
25,000	.10	.17	.50	.38
50,000	.10	.26	.85	.59
75,000	.10	.29	1.00	.74
Aged Hardness (Shore A)				
Cured 10 min.	57	75	88	85
Cured 12 min.	55	76	86	85

In GR-S compounds the effects of high styrene copolymers differ somewhat from their effects in natural rubber. We have noted that, while X34 is more efficient in natural rubber, X43 appears to be superior in GR-S compounds. This difference can be demonstrated in hard, high-quality shoe sole stocks which are made with high rubber resin content to keep the specific gravity low and the abrasion and flex cracking resistance high.

A typical stock of this type would have properties approximately as follows: specific gravity, 1.28 maximum; Shore A hardness, 85 minimum; NBS abrasion index, 25 minimum; and Ross flex life, a rating of 6 maximum after 25,000 flexures. Tensile properties are not critical, but may include minimum values for tensile of 1000 p.s.i., elongation of 200%, and modulus at 200% of 700 p.s.i. Formula D in Table 7 is typical and was used as the control for comparison of our high styrene copolymers. Formula A with no resin was included as being of interest to persons wishing to note the effect of rubber resins on tensile strength and other properties important in applications other than soles. Formulas B, C, and D are compared to the standards in Figure 6.

High Resin in GR-S—NR Blends

As shown in Figure 6 on GR-S-natural rubber blends, X43 meets these standards with respect to hardness, abrasion, and flex life. X34 shows the ability to produce compounds with slightly lower hardness, which give even better abrasion and flex-crack resistance. A combination of X34 with X43 is indicated for GR-S compounds to meet requirements for maximum hardness, abrasion, and flex life in high-quality leather-like shoe soles.

Rate of Cure of GR-S—NR Blends

Figure 7 (data from Table 7) shows the effect of rubber resins on the rate of cure of GR-S-natural rubber blends as measured by tensile strength. Here the resin compounds show a very level cure. This level cure is also reflected in excellent aging characteristics.

Properties of Darex Copolymers 3 and X34

The applications of high styrene copolymers can, in many cases, be traced to their properties as shown in Table 9. Their low dielectric constant, low power factor, and low moisture absorption are useful in wire insulation and molded electrical parts which must be used out-of-doors or under water. Their high tensile strength both in the uncured and cured forms is useful in fast curing semi-hard rubber products. In golf ball cover stocks they will improve cut resistance and maintain resilience.

TABLE 9

Darex Copolymer No.	3	X34
Specific gravity (20° C./20° C.)	1.01	1.04
Elongation (%)	290	Under 100
Tensile strength (p.s.i.)	1600	4080
Water absorption (mg/in^2)* (milligrams per square inch*)	3	4
Hardness (Shore A)	89	Over 100
(Rockwell X15)	No test	90
Abrasion resistance (NBS index)	No test	99.3
Softening temperature (°C.)†	Below 50	90
Brittleness temperature (°F.)	—20	—5
Plasticity (Mooney at 250° F.)‡	60	70
Color	Amber	Light amber
Chemical resistance	Good	Good
Oil resistance	Good	Good

*After 20 hours in water at 70° F.
†Modified ASTM plastic heat distortion method.
‡After 5 minutes with scorch or small rotor.

Use in Flooring

An important use of high styrene copolymers now is in highly loaded stocks for floor tile. In tile compounds they improve processing characteristics, especially in calendering where they help reduce the number of rough

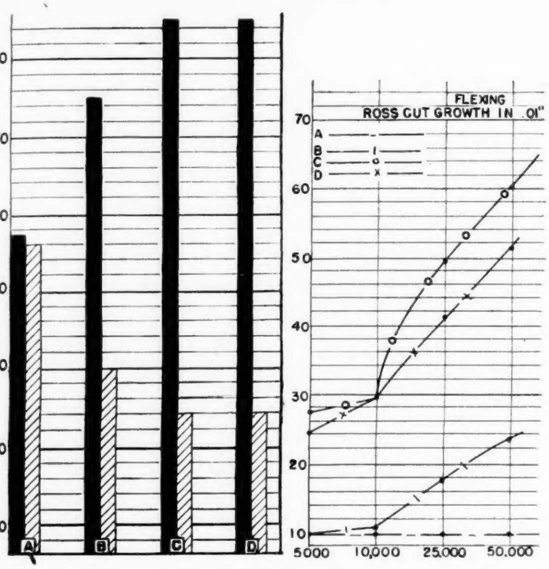


Fig. 6. Properties of High Resin-GR-S-Natural Rubber Blend

and irregular slabs. These copolymers also reduce indentation, increase abrasion resistance, reduce cracking in flexing, handling, and shipping, permit brighter colors, and impart resistance to oils and fats and soap and water. For these same properties these copolymers are used in toys and household rubber products. Small door knobs and novelty coasters are other applications.

Use in Soles

High styrene copolymers are valuable in all types of shoe soles and heels. Combinations of X34 and X43 can be used for light-weight, long wearing soles. These copolymers are used for support and comfort in California-type shoes, for toplifts, and for special leather-like heels. In sport and tennis shoe soles these copolymers improve mold flow and tear resistance. In industrial shoe soles they contribute to oil resistance.

Miscellaneous Uses

In mechanical goods, packings, and gaskets, our copolymers are used for low compression set, high strength, and good chemical and oil resistance. In druggists' sundries they improve molding and hot tear of gum stocks without impairing transparency. In ebonite and semi-hard rubber products, high styrene copolymers improve impact resistance, raise softening point, reduce curing time, and permit lower sulfur content with lighter colors and better aging.

One application where many plants can use high styrene copolymers is in cutting blocks or beam punch pads. These formerly were made with balata or modified rubber blended with natural rubber. One of our customers has developed a thermoplastic pad and has suggested that its formula would be of general interest. This company takes 80 parts of Darex Copolymer 3 for toughness and adds 20 parts of natural rubber for extra resilience. Then sufficient carbon black, wax, and cotton flock are added to meet particular requirements. A 50-50 blend of Darex Copolymer X34 with natural rubber also could be used. The compound is made into sheets without vulcanizing. When the pads become badly cut up, they can be remilled and used over again.

Summary

As the result of our tests we have concluded that rubber resins, because of their low specific gravity, are low-volume cost, high-quality reinforcing agents for light-colored stocks. Dewey & Almy research has produced high styrene copolymers which with natural rubber are outstanding for high tensile, for flexibility, and for good abrasion. They are also excellent for low cut-growth, for high hardness, and for good aging in natural rubber compounds.

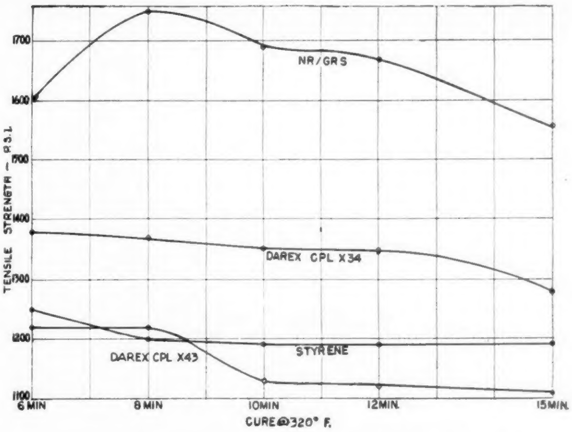


Fig. 7. Rate of Cure—High Resin-Natural Rubber-GR-S Blend

It is impossible to list all those who have contributed to this paper in one way or another, but we express here our appreciation to our friends in the industry for their help and suggestions in its preparation.

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Correction

In the article "Measurement of the Scorch and Cure Rate of Vulcanizable Mixtures Using the Mooney Plastometer," by R. Shearer, A. E. Juve, and J. H. Musch, in our November, 1947, issue, a line was omitted from a sentence at the top of the second column on page 217, which included a definition of the scorch point, T_s. The sentence should have read as follows:

"The measurements which we have used herein to characterize a Mooney cure curve are: the scorch point, T_s (defined here as the time of the last lowest plasticity reading which precedes a consistent rise), the plasticity at the scorch point, V_m, and the time required to reach a specified increase in plasticity over the minimum, $T\Delta_m$."

Semi-Ebonites[1]

Fritz S. Rostler[2]

SEMI-EBONITES are compounds with properties between soft and hard rubber, which properties are brought about by vulcanizing with a medium amount of sulfur. The term semi-ebonites is used to define these compounds, rather than the often synonymously used term semi-hard rubber, since leathery semi-hard rubber compounds can also be produced by high filler loadings and by compounding with resins. This paper deals only with the semi-ebonites, where these properties are obtained through sulfur.

When rubber hydrocarbons are vulcanized with increasing amounts of sulfur, three properties of the vulcanizate change in proportion to the amount of sulfur: hardness, elongation, and elasticity. The hardness increases; the elongation and the elasticity decrease. The appearance and the feel of the vulcanizate change gradually from soft and elastic to hard and rigid, over the intermediate range of leathery properties. These changes in properties of the vulcanizate are shown schematically in Figure 1. A strict definition of the borderlines is neither necessary nor possible. In order to define the subject of this paper the range between 10 sulfur and 25 sulfur is labeled the semi-ebonite range. This is more or less in accordance with general practice.

The hardness range of the compounds in the semi-ebonite range, as defined, is approximately between 40 and 90 Shore A durometer reading, and the elongation at break, between 20 and 300%. This combination of medium to high hardness with low to medium elongation and low elasticity gives the compounds in the medium sulfur range their leathery appearance.

The semi-ebonite range of rubber compounds has always been a stepchild of rubber compounders. Although the literature on rubber is very voluminous, it is only seldom that we come across a reference dealing with semi-ebonite. There are, of course, good reasons for this fact. The principal one is that the rubber compounders' and consumers' experience with this type of vulcanizates has been, as a rule, one of disappointment. As with all our rubber compounding knowledge, the basic facts and principles are derived from studies of natural rubber. The fact that vulcanizates of natural rubber in the semi-ebonite range have poor physical properties and extremely poor aging characteristics has obviously deterred the majority of rubber chemists from spending time on investigating this field. Semi-ebonites made from natural rubber show the well-known deteriorations which start with a glossy, hard skin formation, followed by progressive hardening and cracking on bending. A paper by P. A. Gibbons[3] describes in detail the properties of semi-ebonites from natural rubber. A condensed discussion of these properties with literature references has been given by Cotton in Davis and Blake's "Chemistry and Technology of Rubber."[4]

Purpose of This Paper

This paper reports an investigation carried out for the purpose of comparing the behavior of modern synthetic rubbers with that of natural rubber over the whole

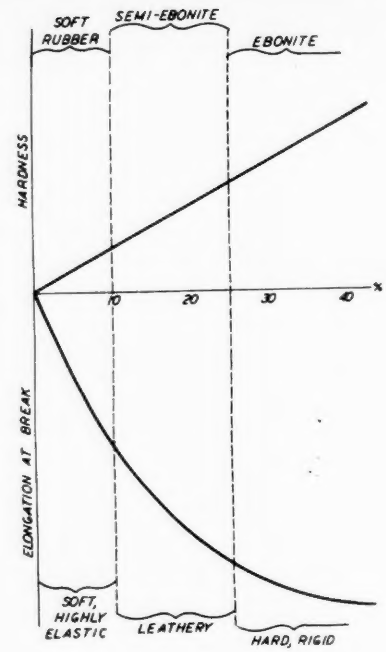

Fig. 1. Sulfur Ranges

range of sulfur, from soft rubber to ebonite. The results of this investigation appear sufficiently interesting to warrant their presentation. The investigation was merely a general study and was not aimed at developing any particular compound. However a great number of compounds have been tested, and some of the data presented might be useful as starting points for compound development.

Scope of Investigation

A natural rubber (smoked sheets), a butadiene-styrene rubber (GR-S), and a butadiene-acrylonitrile rubber (Hycar OR-25) were compounded with increasing amounts of sulfur to give a whole range of vulcanizates from soft rubber to ebonite. Three basic test formulae were used, a pure gum compound, an SRF black compound, and a clay compound. Test compounds were also made to investigate the influence of unsaturated hydrocarbon extenders. Since the aging characteristics of the rubbers themselves were under investigation, no antioxidants were used in the compounds.

The compounds were mixed and stress-strain properties were measured by A.S.T.M. procedures before and after aging in air at elevated temperatures. The aging conditions, 48 hours at 100° C., were found to be most practical for this investigation. Some of the compounds were aged seven days in the Geer oven. The more severe aging conditions, 48 hours at 100° C., were later adopted for the purpose of speeding up the investigation.

The plasticities were determined with a Scott parallel plate plastometer. The figures reported are the compression in 0.001-inch during a 2½-minute compression period, using 15 pounds' load on the spindle and a temperature of 212° F. in the platens. Test specimens were cylindrical, plied up samples, having original dimensions of 1 7/16 inches in diameter and somewhat more than 0.6-inch in height, and were initially compressed in the plastometer to 0.600-inch in a preliminary half-minute warm-up period before starting the test.

A number of cures were made of each compound. As optimum cures were chosen the cures which showed little

[1] This paper was presented before the Northern California Rubber Group in San Francisco, Calif., Sept. 25, 1947.
[2] Director of research and development, Golden Bear Oil Co., Oildale, Calif.
[3] P. A. Gibbons, *Trans. Inst. Rubber Ind.*, *10*, 494 (1935).
[4] P. 535. Reinhold Publishing Co., New York. 1937.

increase in modulus and hardness on prolonged curing and which showed no sulfur bloom. This latter consideration is especially important in compounds containing high amounts of sulfur.

A great number of tests were made. The most characteristic results, which illustrate the findings, are given and discussed below.

The Behavior of Natural Rubber

The three series of compounds reported in Tables 1, 2, and 3 demonstrate the behavior of natural rubber. In Table 1 are reported the test results on four compounds in the medium sulfur range, a pure gum compound, a compound containing an unsaturated hydrocarbon extender, a compound containing the unsaturated hydrocarbon extender and SRF black, and a compound containing the unsaturated hydrocarbon extender and clay. The clay and SRF black were incorporated in the form of premixed preparations with the extender. This method of compounding was used to facilitate handling and to shorten the mixing time. The principles of this mixing procedure have been described in a previous paper.[5] The compounds were vulcanized for 15 and 35 minutes at 45 pounds and for 35, 65, 90, and 120 minutes at 80 pounds. The cures compared in this table are those which were the first ones in the series of cures without sulfur bloom, indicating that most of the sulfur had combined. The poor aging characteristics of these natural rubber compounds are clear from the physical test data.

Table 2 shows the same compounds as in Table 1, but with lower acceleration and two different cures—a high one and a low one. The findings in the work reported in Table 1 are confirmed by the results given in Table 2, that is the poor aging properties of these compounds are due to the inherent lack of resistance of natural rubber to such aging and are not caused by conditions of vulcanization. The data in this table show that the same low physical properties are finally obtained by curing to the stage where no sulfur bloom occurs, or by aging the undercured compounds. The compounds reported in this table were cured 15, 20, 35, 50, 80, and 120 minutes at 35 pounds; 20, 35, 50, and 65 minutes at 45 pounds; and 5, 10, 20, and 50 minutes at 80 pounds. The complete test data are plotted in Figure 2. This graph shows more clearly than the table the sensitivity of natural rubber-medium sulfur compounds to curing time and temperature. The high values for the low cures only demonstrate that the sulfur has not combined, as revealed also by the heavy sulfur bloom on the test specimens. Longer cures, as well as aged properties, show that natural rubber compounds with medium amounts of sulfur are rather valueless.

Table 3 presents a series of smoked sheet compounds with increasing amounts of sulfur, based on Compound 4 given in Table 1. The data are discussed later in connection with Figure 4.

Table 4 reports tests made on reclaimed natural rubber, using the same formulations as with the smoked sheets compounds presented in the foregoing Tables 1 and 3. The first five compounds show the influence of increasing amounts of sulfur, and Compounds 3, 6, 7, and 8, the influence of the other compounding ingredients. The physical test data on the compounds corresponding to the smoked sheets pure gum stock and to the one with the extender are somewhat higher with reclaim (compare Table 4, Compounds 7 and 6, with Table 1, Compounds 1 and 2), but that is mostly due to the black content of the reclaim. It might, however, be possible to make some usable semi-ebonite compounds from reclaim, if the desired physical data can be low.

Semi-Ebonites from Hycar OR-25 and GR-S Compared with Those from Natural Rubber

GR-S and Hycar OR-25 compounds were tested, identical with those reported in Table 1 with natural rubber, except that 15 parts of the unsaturated hydrocarbon extender were used in the Hycar compound instead of 35 parts as with the other rubbers, and only 45 parts of filler, instead of 105 as with the other two rubbers. (The amount of unsaturated hydrocarbon extender was reduced in the Hycar compounds to prevent bleeding out of the extender since the grade used in this study is not compatible with butadiene-acrylonitrile rubbers in higher amounts. The amount of filler was reduced since Hycar, being inherently a stiffer rubber, does not require so high a filler content.) In comparing the values given, this fact has to be kept in mind.

TABLE 1

Compound No.	1	2	3	4
Smoked sheets	100.00	100.00	100.00	100.00
Stearic acid	1.00	1.00	1.00	1.00
Sulfur	15.00	15.00	15.00	15.00
Zinc oxide	5.00	5.00	5.00	5.00
Naftolen R100*	—	35.00	35.00	35.00
Suprex Clay*	—	—	—	105.00
Pelletex*	—	—	105.00	—
Benzothiazyl disulfide	1.20	1.20	1.20	1.20
Diphenylguanidine	0.20	0.20	0.20	0.20
Plasticity (compression in 0.001-in.)	380	465	365	420
Optimum cure at 80#	65′	35′	35′	65′
Shore hardness (30 sec.)				
Initial	49	36	73	56
Aged 48 hrs. 100° C.	47	34	82	76
Tensile at break (lbs./sq. in.)				
Initial	330	250	1820	1120
Aged 48 hrs. 100° C.	400	320	800	490
Elongation at break (%)				
Initial	250	260	210	450
Aged 48 hrs. 100° C.	300	370	50	60

*The filler and the extender were incorporated in the form of premixed preparations containing 75% filler and 25% extender.

TABLE 2

Compound No.	1		2		3		4	
Smoked sheets	100.00		100.00		100.00		100.00	
Stearic acid	1.00		1.00		1.00		1.00	
Sulfur	15.00		15.00		15.00		15.00	
Zinc oxide	5.00		5.00		5.00		5.00	
Naftolen R100*	—		35.00		35.00		35.00	
Suprex Clay*	—		—		—		105.00	
Pelletex*	—		—		105.00		—	
Mercaptobenzothiazole	0.50		0.50		0.50		0.50	
Plasticity (compression in 0.001-in.)	340		432		370		410	
Cure—time	50′	35′	50′	20′	50′	35′	50′	35′
Temperature	80#	35#	80#	35#	80#	35#	80#	35#
Shore hardness (30 sec.)								
Initial	49	40	36	30	69	66	58	44
Aged 48 hrs. 100° C.	—	43	—	30	—	66	—	36
Tensile at break (lbs./sq. in.)								
Initial	250	2580	270	1700	1660	1920	1020	1530
Aged 48 hrs. 100° C.	—	130	—	130	—	1020	—	400
Elongation at break (%)								
Initial	160	720	280	730	230	400	350	590
Aged 48 hrs. 100° C.	—	160	—	240	—	150	—	260

*The filler and the extender were incorporated in the form of premixed preparations containing 75% filler and 25% extender.

TABLE 3

Compound No.	1	2	3	4	5
Smoked sheets	100.00	100.00	100.00	100.00	100.00
Stearic acid	1.00	1.00	1.00	1.00	1.00
Sulfur	2.50	10.00	15.00	20.00	40.00
Zinc oxide	5.00	5.00	5.00	5.00	5.00
Naftolen R100*	35.00	35.00	35.00	35.00	35.00
Suprex Clay*	105.00	105.00	105.00	105.00	105.00
Benzothiazyl disulfide	1.20	1.20	1.20	1.20	1.20
Diphenylguanidine	0.20	0.20	0.20	0.20	0.20
Plasticity (compression in 0.001-in.)	415	415	425	410	425
Optimum cure—time	15′	65′	65′	65′	90′
Temperature	45#	80#	80#	80#	80#
Shore hardness (30 sec.)					
Initial	38	43	56	69	85†
Aged 48 hrs. 100° C.	48	63	76	84	86†
Tensile at break (lbs./sq. in.)					
Initial	1800	1010	1120	1530	4600
Aged 48 hrs. 100° C.	1600	300	490	790	4300
Elongation at break (%)					
Initial	600	560	450	270	1
Aged 48 hrs. 100° C.	570	100	60	50	1

*The filler and the extender were incorporated in the form of a premixed preparation containing 75% filler and 25% extender.
† D durometer reading.

[5] F. S. Rostler, H. I. du Pont, *Ind. Eng. Chem.*, 39, 10, 1311 (1947).

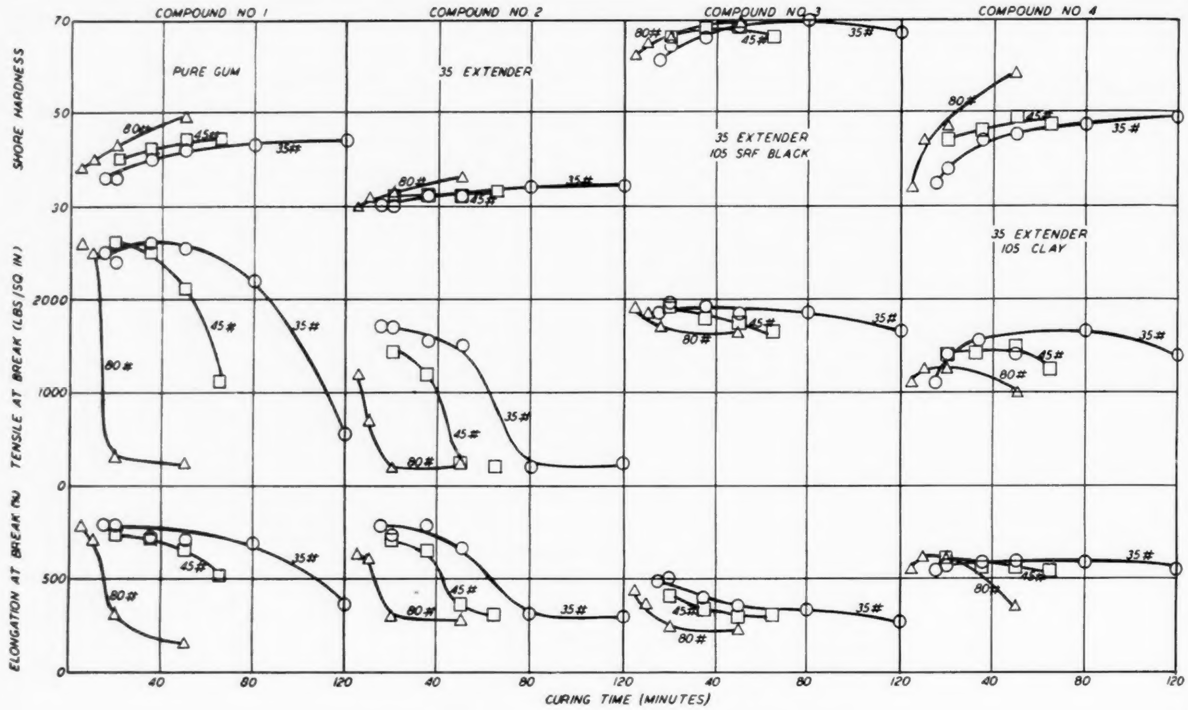

Fig. 2. Variation of Cure on Natural Rubber Semi-Ebonite

TABLE 4

Compound No.	1	2	3	4	5	6	7	8
Whole tire reclaim	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
Stearic acid	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Sulfur	2.50	10.00	15.00	20.00	40.00	15.00	15.00	15.00
Zinc oxide	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Naftolen R100*	35.00	35.00	35.00	35.00	35.00	35.00	—	35.00
Suprex Clay*	105.00	105.00	105.00	105.00	105.00	—	—	—
Pelletex*	—	—	—	—	—	—	—	105.00
Benzothiazyl disulfide	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Diphenylguanidine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Plasticity (compression in 0.001-in.)	145	110	95	95	110	255	135	95
Optimum cure at 80#	65′	65′	65′	65′	120′	65′	65′	65′
Shore hardness (30 sec.)								
Initial	50	73	76	80	84†	63	76	85
Aged 48 hrs. 100° C.	62	82	89	94	84†	74	86	92
Tensile at break (lbs./sq. in.)								
Initial	530	900	960	1250	2650	760	1060	1380
Aged 48 hrs. 100° C.	610	990	570	810	2620	530	440	710
Elongation at break (%)								
Initial	330	190	130	120	1	140	140	70
Aged 48 hrs. 100° C.	160	60	30	30	3	40	40	20

*The filler and the extender were incorporated in the form of premixed preparations containing 75% filler and 25% extender.
†D durometer reading.

TABLE 5

Test Formula	Pure Gum	Extender	Extender and Clay	Extender and SRF black	Pure Gum	Extender	Extender and Clay	Extender and SRF black	Pure Gum	Extender	Extender and Clay	Extender and SRF black
	Natural rubber				Butadiene-styrene rubber				Butadiene-acrylonitrile rubber			
Rubber hydrocarbon	100.00 smoked sheets				100.00 GR-S				100.00 Hycar OR-25			
Stearic acid	1.00				1.00				1.00			
Sulfur	15.00				15.00				15.00			
Zinc oxide	5.00				5.00				5.00			
Suprex Clay	—	—	105.00	—	—	—	105.00	—	—	—	45.00	—
Pelletex	—	—	—	105.00	—	—	—	105.00	—	—	—	45.00
Naftolen R100	—	35.00	35.00	35.00	—	35.00	35.00	35.00	—	15.00	15.00	15.00
Benzothiazyl disulfide	1.20				1.20				1.20			
Diphenylguanidine	0.20				0.20				0.20			
Optimum cure at 80#	65′	35′	65′	35′	65′	65′	80′	65′	120′	120′	90′	90′

The test formulae are given in Table 5, and results of the tests are shown in Figure 3. It can be seen from the test formulae in Table 5 that only the pure gum stock of the Hycar compounds should be used for direct comparison with the other rubbers. The four Hycar compounds are meant to be compared only in the group of Hycar compounds. The bar graphs in Figure 3 show clearly the superiority of both GR-S and Hycar to natural rubber in the semi-ebonite range. The influence of the unsaturated hydrocarbon extender, of the clay, and of the black on the properties graphed are also shown. The solid bars in this figure represent the initial properties, the shaded bars, the properties of the aged compounds (48 hours at 100° C.).

The first vertical column of bars shows the data for plasticity. Each of the four sets of bars in this column

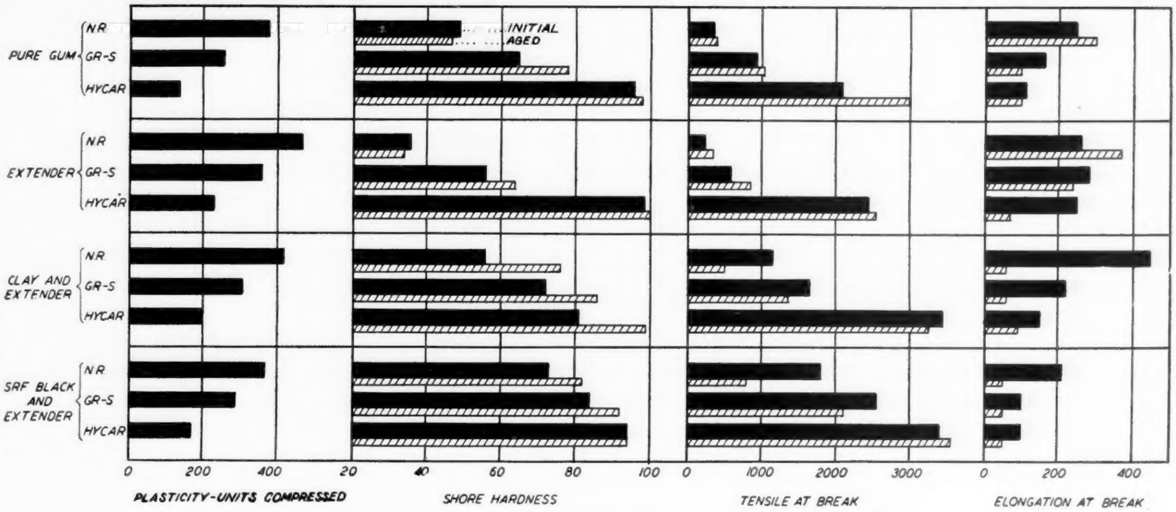

Fig. 3. Comparison of Natural Rubber, GR-S, and Hycar Semi-Ebonites

TABLE 6

Compound No.	1	2	3	4	5	6	7	8
Hycar OR-25	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Stearic acid	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Sulfur	2.00	5.00	10.00	15.00	20.00	30.00	35.00	40.00
Zinc oxide	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Naftolen R100	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Pelletex	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00
Benzothiazyl disulfide	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Diphenylguanidine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Plasticity (compression in 0.001-in.)	125	130	120	115	150	80	85	115
Optimum cure at 80#	50′	60′	60′	60′	60′	60′	60′	60′
Shore hardness (30 sec.)								
Initial	69	81	87	95	51*	89*	90*	88*
Aged 7 days Geer oven	69	84	90	97	77*	91*		
Tensile at break (lbs./sq. in.)								
Initial	2830	3120	3260	3870	3650	7070	8240	8000
Aged 7 days Geer oven	2750	3450	3750	4300	3980	6480		
Elongation at break (%)								
Initial	360	200	120	70	70	5	4	3
Aged 7 days Geer oven	320	170	100	60	41	2		

*D durometer reading.

TABLE 7

Compound No.	1	2	3	4	5	6	7	8
GR-S	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Stearic acid	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Sulfur	3.00	5.00	10.00	15.00	20.00	25.00	30.00	40.00
Naftolen R100	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Suprex Clay	145.00	145.00	145.00	145.00	145.00	145.00	145.00	145.00
Zinc oxide	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Benzothiazyl disulfide	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Diphenylguanidine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Plasticity (compression in 0.001-in.)	290	295	260	260	270	285	290	300
Optimum cure at 80#	60′	60′	60′	60′	120′	120′	120′	120′
Shore hardness (30 sec.)					A D	A D	D	D
Initial	44	51	69	76	84 35	94 47	77	87
Aged 7 days Geer oven	51	61	78	86	93 44	98 61	82	85
Tensile at break (lbs./sq. in.)								
Initial	1125	1340	1380	1340	2040	2720	3120	5380
Aged 7 days Geer oven	950	970	1130	1670	2200	2750	2910	4500
Elongation at break (%)								
Initial	830	660	330	190	130	80	14	3
Aged 7 days Geer oven	760	530	240	130	70	40	3	2

TABLE 8

Compound No.	1	2	3	4	5	6	7	8
GR-S	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Stearic acid	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Sulfur	3.00	5.00	10.00	15.00	20.00	25.00	30.00	35.00
Zinc oxide	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Naftolen R100	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Pelletex	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Benzothiazyl disulfide	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Diphenylguanidine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Plasticity (compression in 0.001-in.)	255	270	255	280	280	300	305	290
Optimum cure at 80#	60′	60′	60′	90′	90′	120′	90′	120′
Shore hardness (30 sec.)				A D	A D	A D	D	D
Initial	56	65	78	84 31	89 40	98 56	72	87
Aged 7 days Geer oven	59	67	81	87 33	91 40	99 63	74	86
Tensile at break (lbs./sq. in.)								
Initial	1690	1810	2200	2520	3160	3550	3780	5410
Aged 7 days Geer oven	1730	1920	2210	2470	2900	3320	3150	5700
Elongation at break (%)								
Initial	400	230	140	110	100	38	29	4
Aged 7 days Geer oven	350	230	110	110	70	29	22	2

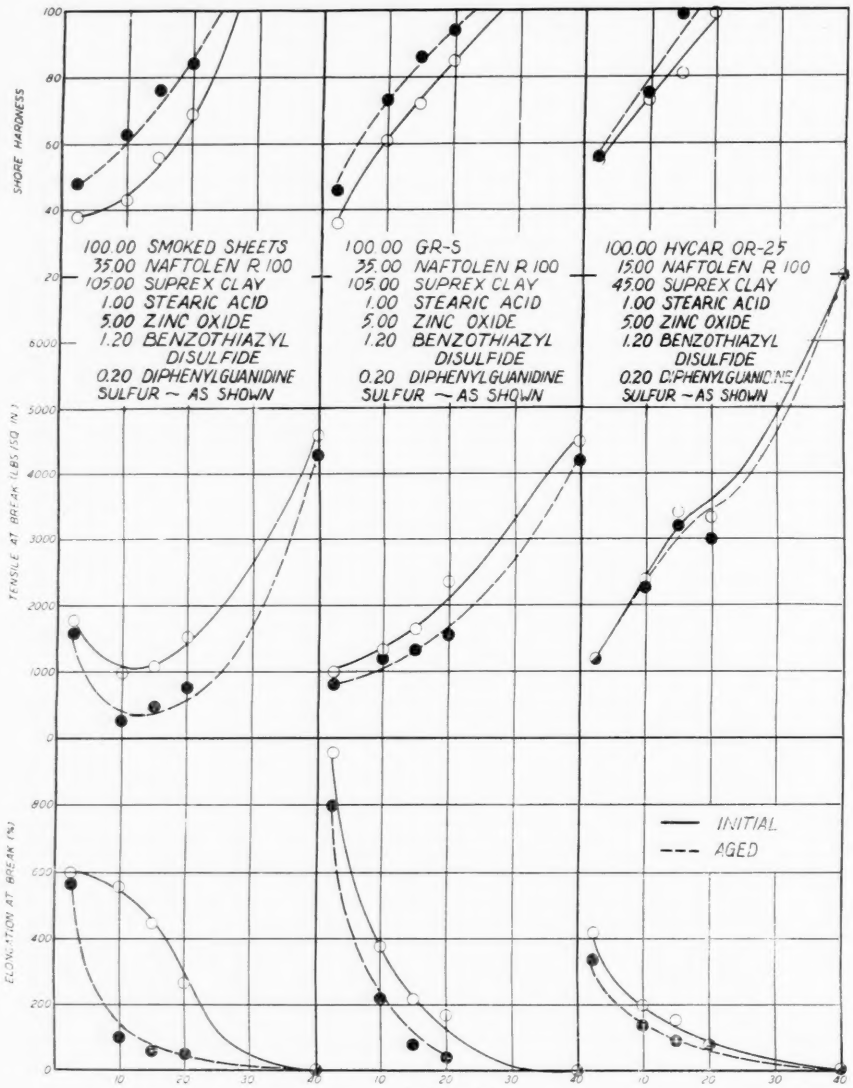

Fig. 4. Effect of Sulfur Variation on Natural Rubber, GR-S, and Hycar

shows the decrease of plasticity from natural rubber to Hycar. The softening effect of the extender can be seen by comparing the first two sets of bars. The influence of the clay and the SRF black on plasticity can be seen by comparing the bars in the second set with those in the third and fourth sets. The second vertical column of bars presents the data for hardness; the third one, those for tensile; and the last one, those for elongation. The effect of any of the components on these properties can be seen by making the same comparisons as pointed out with the plasticity.

In Table 3 were presented the data for a series of smoked sheets compounds with increasing amounts of sulfur. In Figure 4 is given a comparison of the three rubbers as they respond to increase of sulfur when using the same series of test formulae, except that less extender and less clay were used with Hycar. The solid lines are for the initial properties; the broken lines, for the aged properties. The outstanding feature of this figure is the minima in the tensile curves for natural rubber, characterizing rather strikingly the semi-ebonite range as impractical. No such minima appear in the curves for the other two rubbers, where the tensile increases gradually and similarly to the hardness, while the elongation decreases. (In the comparing of the data for the three rubbers it has to be kept in mind that the Hycar compounds contain only 15 parts of extender and 45 parts of clay; while the others contain 35 parts of extender and 105 of clay.)

Further Tests on Hycar

Table 6 reports a series of compounds based on Hycar OR-25 and SRF black. This series of compounds shows lower plasticity values than the compounds reported in Figure 4, owing to the reduced amount of plasticizer and the use of SRF black instead of clay. The aging properties of the compounds are again good, as with previously shown Hycar compounds. The aging of these compounds was carried out in the Geer oven seven days at 70° C.).

Further Tests on GR-S

In order to check on the suitability of GR-S for semi-ebonite in compounds of various compositions, the test series reported in Tables 7-10 were mixed and tested.

The data are presented again principally with the thought in mind that these series might contain a suitable starting compound for further work.

Table 7 reports a series of compounds similar to those presented in Figure 4. However the compounds contain a higher amount of clay, and the sulfur variation is in smaller increments. The gradual increase of hardness and tensile and the gradual decrease of elongation are clearly shown in this series. Aging is good over the whole sulfur range.

Table 8 reports a series of GR-S compounds containing 100 SRF black and 35 unsaturated hydrocarbon extender with increasing amounts of sulfur. Like the comparable series with clay, this series shows that GR-S gives usable compounds over the entire sulfur range.

TABLE 9

Compound No.	1	2	3	4
GR-S	100.00	100.00	100.00	100.00
Stearic acid	0.50	0.50	0.50	0.50
Sulfur	15.00	20.00	25.00	30.00
Zinc oxide	5.00	5.00	5.00	5.00
Naftolen R100	5.00	5.00	5.00	5.00
Pelletex	100.00	100.00	100.00	100.00
Benzothiazyl disulfide	1.20	1.20	1.20	1.20
Diphenylguanidine	0.20	0.20	0.20	0.20
Plasticity (compression in 0.001-in.)	125	125	125	120
Optimum cure at 80#	90′	90′	90′	90′
Shore hardness (30 sec.)	A D	A D	A D	D
Initial	94 40	98 59	100 80	89
Aged 7 days Geer oven	95 52	99 67	100 82	90
Tensile at break (lbs./sq. in.)				
Initial	2600	3610	4450	6150
Aged 7 days Geer oven	2260	2840	3290	4790
Elongation at break (%)				
Initial	50	40	25	7
Aged 7 days Geer oven	40	40	11	2

Table 9 reports four compounds in the semi-ebonite range which contain again 100 SRF black, but only a small amount of plasticizer. These four compounds are interesting to compare with Compounds 5 to 8 of the preceding series presented in Table 8. Consideration of the tensile and elongation figures shows that each of these compounds is most closely comparable with the one in the preceding series having five more parts of sulfur (1 of Table 9 to be compared with 5 of Table 8; 2 of Table 9 with 6 of Table 8; etc.). This is logical in view of the much higher total hydrocarbon content (rubber hydrocarbon plus extender hydrocarbon) of the series given in Table 8. The comparison of the two series shows that the extender, while it has little effect on the physical properties of the vulcanizate, increases the plasticity considerably.

TABLE 10

Compound No.	1	2	3	4	5
GR-S	100.00	100.00	100.00	100.00	100.00
Stearic acid	0.50	0.50	0.50	0.50	0.50
Sulfur	15.00	15.00	15.00	15.00	15.00
Zinc oxide	5.00	5.00	5.00	5.00	5.00
Magnesium oxide, extra light	10.00	10.00	10.00	10.00	10.00
Naftolen R100	—	10.00	20.00	35.00	50.00
Pelletex	100.00	100.00	100.00	100.00	100.00
Benzothiazyl disulfide	1.20	1.20	1.20	1.20	1.20
Diphenylguanidine	0.25	0.25	0.25	0.25	0.25
Plasticity (compression in 0.001-in.)	90	120	185	265	315
Optimum cure at 80#	90′	60′	60′	60′	90′
Shore hardness (30 sec.)					
Initial	98	96	94	90	86
Aged 48 hrs. 100° C.	98	97	96	94	90
Tensile at break (lbs./sq. in.)					
Initial	2870	3580	3410	2840	2480
Aged 48 hrs. 100° C.	2930	3150	2970	2720	2490
Elongation at break (%)					
Initial	50	70	80	80	100
Aged 48 hrs. 100° C.	30	50	60	60	70

Table 10 shows the influence of increasing amounts of unsaturated hydrocarbon extender in GR-S semi-ebonites. In this series is seen the effect of increasing extender concentration at a constant sulfur level. Increasing the extender content provides a means of regulating the plasticity to any desired softness. The effect on the physical properties of the vulcanizate corresponds to a gradual decrease in sulfur concentration. This effect can be offset by increasing the sulfur to bring the physical properties back to the same level as the compound without extender. Ten parts magnesium oxide have been used in addition to the zinc oxide in this series of compounds since this addition was known to improve the aging characteristics of the compounds, possibly by activating the cure. The physical properties are also somewhat higher, as can be seen by comparing Compound 4 of Table 10 with Compound 4 of Table 8.

Summary and Conclusions

To summarize the principal results of the present investigation, it was found that while natural rubber is a poor raw material for the manufacture of semi-ebonite, butadiene-styrene and butadiene-acrylonitrile rubbers are suitable raw materials, especially in combination with unsaturated hydrocarbon extenders of the Naftolen type.

The superiority of GR-S to natural rubber in the form of semi-ebonite should be an interesting piece of information for every compounder conscientious about the importance of keeping up the use and the manufacture of GR-S. With natural rubber becoming more and more available, there exists, as we all know, the definite danger that GR-S will be pushed into the background. As a matter of fact, we are approaching the situation where the supply of rubber hydrocarbons, natural and synthetic, will exceed the demand by multiples if new uses for rubber in large volume are not found. The increased use of rubber products in the building and construction industry and in road surfacing might provide such an outlet for rubber. Semi-ebonite with good aging qualities might find many uses along these lines. It might lend itself to the manufacture of floor coverings, of waterproof wall insulation, etc.

The possibilities of using semi-ebonites from GR-S for tire beads has been suggested in a previously published article,[6] but no detailed study comparing various rubbers has been reported. The primary purpose of this report is to present these basic data, which can be used as starting points for compound development and to point out that we have in the semi-ebonite range a possibility of using GR-S to advantage.

As to butadiene-acrylonitrile rubbers, with which, in distinction to GR-S, very useful semi-hard rubber products can be made with phenolic resins, the use of the medium sulfur range opens the possibility of making semi-ebonites which are easier to process and cheaper than resin combinations. The use of plastics in the rubber industry was recently discussed and summarized by Winkelmann.[7]

The compounding of semi-ebonites with Naftolen-type products presents a means to regulate the plasticity of the uncured stock as well as the elongation of the vulcanizate. Aging and prevention of sulfur bloom appear also improved. In other words, it was found that the combined use of 15 to 20 parts of sulfur with 15 to 50 parts of a Naftolen-type hydrocarbon gives a satisfactory semi-ebonite with GR-S, as well as with Hycar, and both these rubbers appear superior to natural rubber in semi-ebonites.

The experiments reported in this paper were carried out some time ago in the laboratories of Wilmington Chemical Corp. The permission to use its laboratory facilities for this work and the cooperation of the laboratory staff are greatly appreciated.

[6] W. H. Grote, F. S. Rostler, *Rubber Age (N. Y.) 57*, 685 (1945).
[7] H. A. Winkelmann, India RUBBER WORLD, 113, 6, 799 (1946).

EDITORIALS

Further Thoughts on Rubber Policy

ONE obvious reaction on reading the great volume of testimony presented at the recent hearings of the House Armed Services Subcommittee on rubber is to wonder what the final Congressional action on this problem of national policy on rubber will be. There appears to be a large measure of agreement among representatives of the rubber and associated industries and the government on many basic issues and almost no agreement on some others. A compromise on certain points of action at a later date is therefore indicated.

As a result of a study of much of this testimony together with comments from other sources, certain conclusions have been reached which are presented for consideration by the Congress and the industry for use in formulating new legislation on rubber, necessary on or before March 31, 1948.

1. National security in rubber is the first purpose of any legislation, *but* provisions for national security should not be used to stifle private industry in its efforts to develop and produce better synthetic rubbers.

2. To insure national security in rubber the United States must have, as soon as possible, a rotating natural rubber stockpile of at least 700,000 long tons *and* a technologically advanced synthetic rubber industry.

3. Existing world conditions in general and in the production and distribution of natural rubber in particular, require that the mandatory use of general-purpose synthetic rubber be continued in the United States until such time as the natural rubber stockpile is achieved and its rotation assured, *and* that the establishment of an active and technologically advanced synthetic rubber industry be also assured. A period of from one year to two years will be necessary to complete these projects, according to current estimates.

4. During these one or two years, in order that all manufacturers of rubber goods operate on the same basis with regard to the mandatory use of synthetic rubber, the responsibility for the sale of all such rubber should remain a government function. The responsibility for the production of this rubber may be wholly or partially that of the government.

5. The extent of the mandatory consumption of synthetic rubber should be determined by the National Security Resources Board after consultation with both government and industry and should be possible of variation in total amount. Each change in total amount used should require the approval of Congress. The synthetic rubber for mandatory use should be confined to tires, tubes, camelback, and possibly latex foamed sponge products.

6. The government should be responsible for the maintenance in operation or standby condition of facilities for the production of butadiene-styrene or other general purpose rubber of not less than 600,000 long tons a year and Butyl rubber of at least 60,000 long tons a year.

7. Insofar as possible, provision should be made for free competitive production and research on all synthetic rubbers. This might be achieved by modifying the patent cross-licensing and exchange of information agreements, as of March 31, 1948, to permit private industry to realize a proper reward under our patent system for new processes and products resulting from research and development financed by private funds. A new process or product developed by private industry should be possible of production or use by private industry in its own plants or in plants leased or purchased from the government. If a new rubber will permit the manufacture of superior products in the fields where mandatory use is required, the government should buy this rubber and sell it to the manufacturers of rubber goods at the standard price in effect at that time for rubber produced in government-owned plants. If the government desired to produce the rubber itself, a license should be obtained and royalties paid to private industry.

8. Total synthetic rubber production capacity maintained in operation by the government may be equal or less than that required to satisfy mandatory use demands. If a private firm is interested in purchasing a government plant and operating it to provide synthetic rubber for mandatory use consumption, it should be permitted to do so.

9. In the same manner, the facilities in standby condition need not remain under government ownership. If private industry is willing to purchase these plants and maintain them in proper standby condition in return for an option to purchase as an investment for future operation privately, it should also be permitted to do so.

10. It is apparent that there is a difference of opinion between government and industry as to the cost of producing synthetic rubber. The suggestions in paragraphs 7 and 8 above, if adopted, should permit private industry to produce synthetic rubber, either for mandatory or voluntary use and realize a profit if it can successfully reduce the costs reported by the RFC at the present time. If a private firm operated its own plant under contract with the government to supply rubber for mandatory use requirements and was able to show a profit, the company would be building up knowledge of value for operation in either free competition or in a national emergency. If the company operated a plant for the voluntary use market, similar results should be realized.

In his testimony before the Shafer Committee, E. R. Bridgwater, of the du Pont company, made the point that to have maximum effectiveness, research must be integrated with the operating plant. This result can only be attained if both government and industry have equal opportunity to conduct research and development on synthetic rubbers and to operate producing plants.

It is hoped that the suggestions contained in this editorial will be of assistance in the formulating of a program best for the country and the industry, some action on which is required by April 1, 1948.

Plastics Technology

Some Recent Developments of the British Plastics Industry[1]

P. A. Delafield[2]

THE extrusion of thermosetting plastic materials of the phenol-formaldehyde and urea-formaldehyde types has reached a very successful stage of development in England. A small section of the organization which I represent is producing 40 or 50 extruded cross-sections of the most varied character for use in the production of kettle handles, curtain rails, lamp stands, table moldings, busbar housings, overhead crane runways, electric cooker regulator covers, towel rails, and rods, tubes, and other unlimited varieties of extrusions suitable for further machining purposes. Certain licensees are also extruding goods of a specialized nature for their own needs.

Extrusion of Thermosetting Materials

Whereas the thermoplastic materials are rapidly and inexpensively extruded, the thermosetting materials are comparatively slow in processing. No scrap is made, however, and the dimensional accuracy and precise finish of these extrusions put them in an entirely different class.

The products of British Resin Products, Ltd., my organization, are typified by the sample Rockite extruded sections shown in Figure 1, which are all of the phenol-formaldehyde type. The best example of the work of a licensee extruder is the duplicating cylinder made by the Gestetner Duplicator Machine Co., London. Since these people adopted the process, they have extruded some 200 tons of Rockite phenol-formaldehyde molding material, and from it have produced tubing having a total length of over 200,000 feet, or 42 miles. The Gestetner company has authorized me to say that it has experienced no difficulties whatsoever with the process that would prevent it from being worked successfully by any firm with a knowledge of normal molding techniques.

A few more facts about this typical example of extrusion may be of interest. The method previously employed by Gestetner to produce the cylinder bodies for its duplicating machines was to mold one-piece tubes approximately nine inches long. These moldings gave very indifferent results because the normal molding technique could only produce a cylinder having varying densities throughout its length, which resulted in movement of the cylinder after it had been finally machined and assembled. This varation in density, furthermore, occasioned a good deal of trouble during the cylindrical grinding because of the reaction of the grinding wheel to the varying density throughout the cylinder's length.

The adoption of the extrusion process eliminated at one stroke the majority of these difficulties. The tube is now extruded to an outside diameter of 4.700 inches which is then machined down to a diameter of 4.680 inches $\pm$ 0.001-inch. The extruded tubing is cut into lengths of either nine or 17 inches, and these are given final post cures in an oven at 160° C. for 3½ hours. It is found that this treatment results in the final product being completely inert, and no dimensional changes take place even after years of service. It is of interest to note that the standard acetone extraction test gives a value of 2.7% for these tubes after post cure.

I have described the Gestetner case in some detail because it is an excellent example of the application of extrusions to a high-precision engineering job. It should be emphasized, however, that for the great majority of applications one of the chief attractions of the extrusion process lies in the fact that products emerge from the dies in a completely finished form, highly polished and dimensionally accurate. Such products are suitable for most decorative and industrial purposes without any further finishing or polishing whatsoever, and they possess the same degree of mechanical strength and dimension tolerances as compression moldings made from the corresponding types of molding materials. The unique position of extrusions will readily be appreciated, filling the gap, as they do, between the fully shaped moldings finished in three dimensions in steel dies, and sheet materials which are molded in one fixed dimension and require machining in the other two.

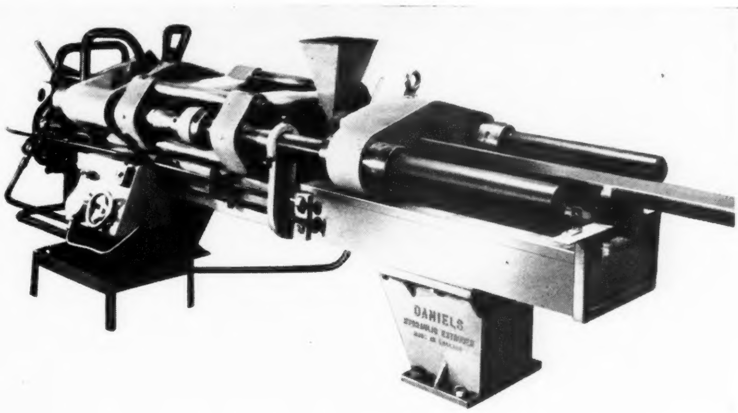

Fig. 2. Daniels Extrusion Press with Automatically Reciprocating Hydraulic Ram

Extrusion Process

Coming now to the details of the actual process, this can best be readily described as consisting of a form of continuous compression molding in a special press with an automatically reciprocating hydraulic ram (see Figure 2). In a steel die of substantially uniform section, the end farthest from the feed is open so that the fully molded and cured section can be forced out at a speed dependent, among other factors, on the rate of feed and pressure at the inlet end.

The pressure is applied to the inlet or feed end by means of a steel plunger or ram. This is caused to reciprocate automatically, taking with it a fresh charge of molding material at every stroke. The die (see Figures 3 and 4) is arranged for differential heating, being water cooled at the feed end and electrically heated to

Fig. 1. Typical Extruded Sections Made from Rockite Phenol-Formaldehyde Molding Powder

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[1]Presented before Rubber Division, Chemical Institute of Canada, annual conference, Banff, Alta., June 10, 1947.

[2]Director of British Geon, Ltd., British Resin Products, Ltd., both of Abbey House, Baker St., London, N.W.1, England.

Fig. 3. Extrusion Die with Punch and Mandrel Exposed

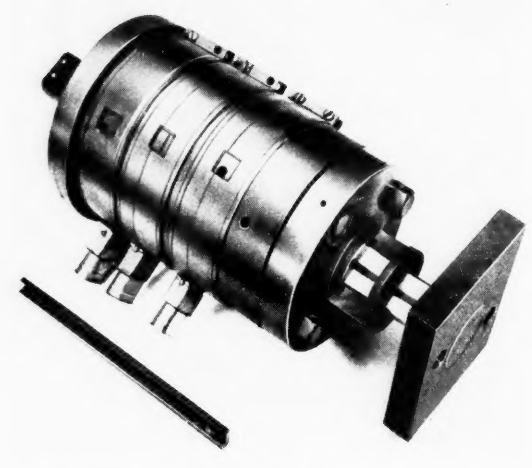

Fig. 4. Extrusion Die Assembled with Punch and Heating Bands

165-185° C. at the outlet end, so that the material passes through zones of steadily increasing temperature. Molding pressure is established by a back pressure exerted on the rigid cured section and builds up to five to seven tons per square inch in the flow zone where the material is plastic. This is a result of sliding friction between the die walls and the section itself and, if necessary, can be supplemented by the application of breaking devices such as an adjustable chuck acting on the section as it emerges. This enables fine control of the b ck pressure to be exercised during the extrusion process.

Each charge of molding powder, which may be fed in either cold or prewarmed condition, upon entering the feed end is first compressed in the water-cooled zone of the die to a pellet of maximum density having a shape approximating that of the finished section. The pellet then enters a tapered zone where the temperature is slowly raised to about 120° C., and the material is further compressed, heated, and forced into the finished shape of the required section. At this stage the material has traveled a distance of not more than three to five inches along the die. The tapered zone then merges into a zone of substantially parallel walls extending from eight to 18 inches, according to the thickness of section, in which the material is finally shaped, consolidated, and raised to its maximum temperature just before emerging from the die. Each stroke of the die plunger causes a progression of the material through the die, with a momentary pause at the end of each stroke. This pause causes no weakness or marking in the surface of the extrusion, since each forward movement of the section does not exceed four inches, dependent on circumstances, and the overall length of the die is at least two or three times this length.

Extrusion Materials

The thermosetting materials of the phenol-formaldehyde and urea-formaldehyde types, with fillers of wood flour and other materials of short fiber length, have so far been employed to the greatest extent. They are based on resins substantially similar in composition to those employed for normal hot compression molding purposes. The extrusion compositions, however, are especially prepared and compounded to give high plasticity under heat and pressure to assure good welding and to have the ability to set rapidly to the fully rigid state. The importance of this point will be obvious. In general, these compositions conform with Type G (general type) of British Standard 771, "Moldings and Molding Materials, Synthetic Resin (Phenolic)." They have a tensile strength of 7-8,000 p.s.i., and impact strength of 0.15-0.17 ft. lbs.

In addition, extrusions can be prepared from molding materials corresponding to special types, including those known as odorless, high dielectric, non-carbonizing, etc. The extrusions can be made in black, brown, and all the other colors normally available in phenol-formaldehyde materials.

Design Factors

It is in the correct design of dies that the secret of successful extrusion lies. The dies are of high-quality steel and must be most carefully designed in conformity with standards built up by experience. It should be emphasized that the establishment of these complex standards constitutes a major part of the "know-how" of successful operation. It is necessary, for instance, to know for each class of extruded section details such as the relation between the shape of the punch with its punch chamber at the feed end of the die and the cross-section of the finished extrusion. A slight progressive taper at each zone of the die is necessary to maintain an even frictional resistance to the forward movement of the hardening material. This must be accurately calculated in relation to the wall thickness and shape of the section, and other factors. Due allowance must be made for the inherent shrinkage which takes place during the transformation of the material from the plastic to the fully thermoset condition.

The effect of shrinkage is obviously of special importance in the case of dies embodying a central core or mandrel, as in the case of hollow cylinders or tubes. Mandrels require especially careful design. In addition, this thermal shrinkage, which amounts to about 0.007-inch per inch of cross-section, must be allowed for when working to close dimensional tolerances. These are just examples of the type of design problems which have occupied our design engineers for some years past.

It is apparent that the dies, into which so much design thought has been concentrated, must be accurately machined and made of the very best quality nickel chrome tool steels, and must embody the highest degree of tool-making workmanship. For good results all working surfaces must be highly polished and chromium plated. Apart from periodic replating and barring accidental damage, such tools will then produce several hundred thousand feet of extrusion. Although the initial cost of such a die may seem to be a large outlay, the cost per foot of finished extrusion is quite small. To keep down the cost of new tools every effort is made to standardize all tool accessories, such as bolsters, cooling boxes, and heating elements.

There are few limitations to the design of extrudable sections, but a number of factors must be borne in mind: (1) the wall thicknesses should be as uniform as possible, since widely differing thicknesses in close proximity may cause internal strains which in extreme cases may lead to warping in the length; (2) sections should be as simple as possible, and provisions should be made for suitable planes along which the die may be split to enable its interor to be machined; (3) the production of tubes or hollow sections of any shape requires the use of a mandrel within the die, and the provision of such mandrels contributes considerably to the cost of the tool as a whole; and (4) very thin walls should be avoided, especially in tube form as unduly high working pressures are required which result in excessive wear. The internal wear on tools is somewhat greater than in the case of ordinary pressure moldings because of the continuous friction which replaces the intermittent flow in the normal molding operation.

Machining Operations

In general, it may be said that all machining operations normally possible on phenol-formaldehyde moldings are equally feasible on extrusions. Special mention should perhaps be made of the bending possibilities, since the extruded sections cannot be bent and fitted for assembly. This limitation, in contradistinction to the flexibility of the thermoplastic materials, is in some measure balanced by the advantage of higher heat resistance. Considerable ingenuity has been displayed in producing extrusions which are bent or curved during processing, and patents have been taken out on these methods.

Synthetic Resin Adhesives

A product of the plastics industry of

which widespread use was made in Great Britain for war purposes, and for which there is an undoubted future, is the synthetic resin adhesive, of which several chemical types are available. Much prominence has been given to the use of this class of adhesive for the building of aircraft. It is said that, but for the invention and rapid development of this type of adhesive, aircraft whose names are now household words, such as the DeHavilland "Mosquito," would never have been built and perhaps not even designed. Undoubtedly the performance of synthetic resin adhesives in this industry must rank very high among their achievements, but should not be permitted to dwarf their achievements in other industries. In particular, there should be mention of the part such adhesives played and continue to play in the construction of small craft for the British Admiralty. The tonnage consumed in this way is very small as compared with that used by the aircraft constructors, but the advantage of the use of these adhesives is no less remarkable, and new possibilities have been opened up on the design of high-speed water craft.

For example, Vosper, Ltd., builder of Sir Malcolm Campbell's world record holding "Bluebird," is building armament-carrying high-speed craft in a completely unorthodox manner owing entirely to the properties of one particular type of synthetic resin adhesive. This is a cold setting acid-catalyzed phenol-formaldehyde resin type of adhesive manufactured by British Resin Products, Ltd.

With the permission of Commander Du Cane, of Vospers, some description can be given of that company's work. With a view toward eventually building a larger boat of the motor torpedo boat type, and on the principle generally accepted in Great Britain that high-speed hulls must be built with a minimum of weight, Vospers decided to build a 40-foot high-speed day cruiser in a structural design entirely different from the conventional type.

In place of solid, multi-ply sawed frames and double diagonal mahogany planking with oiled calico between the skins, and the whole screwed and clenched in position to a solid timber hog, this experimental boat has laminated hog, stem, and engine girders built up from spruce glued with this cold-setting synthetic adhesive. The frames are of birch plywood web glued to double outer mahogany fillets, and each fillet is glued in to the hog. The planking is of a double layer of quarter-inch diagonal plywood glued each to the other and to the frames. The deck planking consists of a single skin of birch plywood with seams butted together, with a ply strip underneath, and the whole glued in position. The synthetic adhesive provides the only means of fastening used in the boat except for nails for tacking purposes where it was found difficult to shore or cramp components while the adhesive set. The boat was built, and its performance has amply justified the courage of its designers and corroborated the beliefs of the technical staffs of both Vospers and the adhesive manufacturer.

The main advantage of building craft in this unconventional manner is the saving in weight achieved, which permits the boat to carry a greater armament at a higher speed for the same power. Secondly, the boats can be built more rapidly because units such as the frames can be prefabricated. Thirdly, by the laminating of the hog and similar structures, the use of sound timber is assured.

As for the adhesive itself, it is capable of setting at low temperatures, so low, in fact, that during the past winter glueing continued uninterrupted at temperatures which were low even for boatshops. It is a non-crazing, gap filling adhesive which is immune to bacteriological attack, has a high degree of water resistance, and gives extremely high joint strengths. The adhesive was mixed with an orange-tinted hardener to assure adequate and uniform spread and in the planking operation was used in conjunction with a special wetting agent separately applied to assist application and improve joint strength. Before this task was undertaken, elaborate tests were made to determine the suitability of the adhesive for the type of construction contemplated and for the timbers to be used. It is acknowledged that but for this particular phenolic adhesive the project would not have been undertaken.

Polyvinyl Chloride Pastes

Everyone will agree that shortages of raw material, and the subsequent necessity of developing replacement materials or new methods of using existing products, are excellent spurs to invention and development. P.V.C., or polyvinyl chloride, pastes are a good example of this principle.

During the war shortages of rubber and other materials used for coating cloth resulted in the widespread use of vinyls for such purposes. In the United States and Canada where these resins were made, suitable solvents and equipment were readily available for handling these resins. In England, however, the acute shortages of solvents and calendering equipment fostered the development of a new type of spreading compound known as P.V.C. paste.

When such a paste was spread on a cloth, it was found that a thick coating could be applied in a single pass under a doctor knife and that, provided sufficiently high temperatures were used, a tough film could be formed on the backing having all the properties of a similar coating applied either from solution or by calendering. These pastes are 100% solids and contain no solvent and, as a result, have many obvious advantages quite apart from the question of cost.

In Germany selected paste-making resin was used not only for the preparation of coated cloth, but also for the manufacture of shoe soles. Full details of these products have been given in reports issued by the many investigators who have visited Germany.

During the war a considerable yardage of ground sheet material was made in England on this basis and gave a very appreciable resultant saving in solvent. In addition, the final article was of very high quality and generally far superior to the degraded rubber compositions which had been previously employed.

Work in England on the production of paste-making polymer has been carried out largely by Distillers Co., Ltd., and Imperial Chemical Industries, Ltd. In the case of material made by Imperial, it is possible to select from the standard polymer some percentage which with suitable manipulation can be made into paste having a useful but somewhat short life. Distillers Co. has worked on the problem from a different angle and by suitable adjustment of polymerization conditions and choice of dispersing agents has produced a resin which, when mixed with a plasticizer, immediately forms a fluid paste. Furthermore the viscosity of this paste undergoes an initial increase, but then remains constant for a period of months. Such a stable paste can be pigmented and filled within the normal limits used for P.V.C. and can be applied to a variety of backings by normal methods. British Geon, Ltd., an English company formed by B. F. Goodrich Chemical Co. and Distillers Co., Ltd., will be making this polymer in England just as soon as the plant is available. In the meantime Goodrich is going ahead with this type of production.

Cloth Coating

The point that the equipment used for paste manipulation is much simpler and less expensive than that used for the solvent process or calendering is particularly important in the coating of cloth. By this process it is no longer necessary to have a long spreading chest, as the material is easily applied by passing the cloth between the doctor knife and a steel roller and immediately bringing the uncoated side of the cloth in contact with a hot cylinder of suitable dimensions for 1½ to two minutes at a temperature of over 160° C. The gelled film is then cooled somewhat by passing it over a cooled roller and is finally embossed on the same machine by passing it between small-diameter embossing rollers. Such equipment can be made at a cost very much lower than even the most simple rubber spreading machine, and the space it occupies is comparatively small. After flexing for 140 hours at the rate of 160 flexes per minute, paste-coated cloth shows no signs of cracking.

Other Applications

Some other very interesting developments involve the use of these pastes. For example, work is being carried on in England at present on the coating of wire for electrical purposes. The method used and the equipment employed are extremely simple. The wire is passed through a bath of the paste, then through a smoothing die, and immediately into a heated tunnel where the coating is set. With the use of a standard paste with a 60:40 resin-plasticizer content, a 0.005-inch coating of insulation can be applied to the wire in one pass through the bath. Such a method has obvious attractions as the amount of coated wire produced can be extremely large compared to the capital outlay on the equipment used because no heavy extruders or mixing plant is required.

Another interesting development is the molding or casting of paste. Because of its 100% solids content, there is a negligible shrinkage of the material as it sets, and it is possible to cast complex shapes by pouring into a hot mold and subsequent gelling. Hollow articles can be produced in this way, as well as complex moldings with undercuts.

We are also trying to develop the production of beach shoes and slippers from paste. In this case the sole is made by casting around a suitable insole, such as felt, and heat sealing the upper to the shoe during the casting treatment. In the case of soles, light pressure is applied during the molding, but here again the production of comparatively large numbers of shoes can be carried out by using only a moderate amount of equipment.

We believe that applications for paste have only just begun to be fully investigated. Many other applications spring to mind, such as dipping complex sections to obtain a thick resin layer in one immersion. One item very successfully produced from paste during the war was the distributer head cover for motor cars. In this case the item not only has the advantage of being made in one dip, but is also very suitable for the application because of the solvent-

resistant properties of the compound itself.

Paste can also be used to cast molds for molding penolic resins. By use of paste it is possible to cast molds of extremely complex shape and having undercuts. Cast articles can easily be removed from the mold because of the resilience of the mold.

There is no doubt that many other applications will develop in the course of time. To us in England the use of paste is of particular interest because once we have the material, we can proceed to put it to use without expensive and complicated processes and machinery which takes time to make and deliver.

Discuss Plastics Machinery

THE Rhode Island and Southeast Massachusetts Section, Society of Plastics Engineers, held a regular meeting on December 10 in the Providence Engineering Society Building. Fifty members and guests attended the session which was featured by a talk on "Plastic Machinery and Equipment" by George Whitehead, of Improved Paper Machinery Corp.

This talk dealt with some of the problems that confront the engineer in designing plastics molding machinery and equipment and the solutions to these problems. Samples of thermoplastic materials illustrating the factors involved in the design of the injection molding machine, the temperature and pressure cycles in the molding technique, and the proper control of physical properties in the finished product were circulated through the audience during the discussion. The speaker also reviewed the difficulties encountered in molding both large and small parts from various thermoplastic materials using the combination injection and pressure molding method. Following the talk there was a question and answer period which included a discussion on design factors for proper temperature and pressure controls.

In the business session, ballots were issued the members for the election of three directors for the Section and one representative to the national S.P.E. council. Results of the election will be announced at the Section's next meeting, to be held January 14. At this time the new officers for the Section, as elected by the directors, will be announced and presented to the group.

Beucken Talks on Extruders

EXTRUSION Machinery for the Plastics Industry" was the title of an address by H. E. Beucken, National Rubber Machinery Co., at the December 2 meeting of the Chicago Section, Society of Plastics Engineers, in the Merchants & Manufacturers Club, Chicago, Ill. Following Mr. Beucken's talk, W. Paul Pincher, Acrilex Sales Corp., spoke briefly on Acrilex, a new acrylic resin claimed to be much easier processing in all respects than the standard resins.

Mr. Beucken described the standard extrusion equipment used in the plastics industry and modifications which can be made on regular machines to take care of special materials. He traced the course of the material through the extruder, beginning at the feed, then through the screw and out of the die, and into auxiliary cooling or stretching equipment. The strainer plate was stated to have two functions: to screen out the unplasticized material and to create a back pressure which holds the material in the extruder until it is sufficiently plasticized.

Advantages of extrusion equipment, the speaker said, include the fact that new dies to make a change in shape are less expensive than new molds for low pressure or injection molding. In addition, the machinery can be used in a continuous set-up, as with monofilaments extruded into a water bath, then stretched on a capstan, oriented on a second capstan, and finally wound on a take-up reel.

Mr. Beucken described the Millstruder, a new machine still under development, which is expected to combine feeding, mixing, and extrusion in one continuous operation. While the machine is suitable for thermoplastic materials, the heat generated makes it unsatisfactory for thermosetting resins except for those having a long set-up period. The possibility of using this machine to mill and extrude rubber continuously, and thus avoid use of the internal mixer, the open mill, and the extruder, is also being actively investigated.

The Millstruder was stated to contain two rolls rotating in a heated jacket grooved in a helical pattern so that material fed into each end of the rolls is moved through the grooves to the center of the rolls and at the same time thoroughly masticated by the roll action. At the center the mixed material is extruded through a conventional die. Each roll is driven independently, and the speed differential between the rolls can be varied.

The Section will hold its annual party on January 9 at the Edgewater Beach Hotel, Chicago.

Dow Packaging Exhibit

"CHEMISTRY is the Foundation of Good Packaging" will be the theme of the Dow Chemical Co. exhibit at the forthcoming Packaging Show in the Public Auditorium, Cleveland, O., on April 26 to 30. The company's exhibit will be divided into three sections. The center section will display the new Saran Film 517 for food packaging; while the other sections will be devoted to Ethocel sheeting, molded Styron containers, and Dow coating materials in new applications. Spacious seating capacity will be provided within the company's booth.

Central Ohio S.P.E. Elects

THE Central Ohio Section, Society of Plastics Engineers, held a meeting on December 12 at the Lancaster Country Club, Lancaster, O., at which some 25 members and guests were present. Prior to the dinner the Section's directors met and elected the following officers for 1948: president, L. E. Cheyney, Battelle Memorial Institute; vice-president, M. W. Burkhart, Plastics Design & Sales Co.; secretary, C. W. Cooper, Battelle; and treasurer, R. D. Beck, Continental Can Co. The new officers will serve as directors of the group in addition to H. C. Simons, Ohio Plastic Co.; N. Roop, Columbus Plastics Products, Inc.; R. L. Davis, Fabri-Form Co.; C. D. Jones, Owens-Corning Fiberglas Corp.; and B. W. Nively, plastics consultant. Messrs. Roop, Simons, and Cooper were elected local section directors by mail ballot, and Mr. Davis was chosen a national director.

After dinner a short business meeting was held, and a motion picture on Tenite was shown by Mr. Carpenter, a representative of the Tennessee Eastman Co. The Section will hold a dinner meeting on January 8 at the Wagner House, Newark. Special films will be shown at this meeting, and G. N. Edwards, president of Ohio Plastics Co., will speak on "Where Are We Going?"

Vintex-Plasti-Cast

NEW and exclusive deeply sculptured designs in flexible vinyl plastic sheeting are now being made available for the first time to the handbag, luggage, shoe, slipper, belt, upholstery, and packaging trades. Brand named Vintex Plasti-Cast, the new material is being introduced in a variety of spring and summer colors in six deeply embossed original patterns called Daisy, Grille, Chain, Hobnail, Spiral, and Cluster. Scuff-proof and waterproof, the material is 36 inches wide and 0.022-inch thick, and is rollercast-embossed to eliminate costly plate marks. In addition the sheeting is made in continuous rolls which eliminate excessive cutting losses. Distinctive in design, the new product, it is claimed, has unsual tensile strength, excellent aging qualities, and can be sewed, heat-sealed, stapled, or cemented.

Report on German Vinyl Pastes

COATED fabrics, shoe soles, and surgeons' gloves were made in Germany in large quantities from polyvinyl chloride paste dispersions, according to a report now on sale by the Office of Technical Services. The report, PB-77673, "Paste Dispersions of Polyvinyl Chloride," by OTS Investigator Clayton F. Ruebensaal, describes the fabricating of plasticized polyvinyl chloride articles by means of resin dispersions in plasticizer. According to the report, the state of development of these dispersions was much more advanced, and the range of applications much wider than used in the United States.

The report contains information on the general properties of the paste dispersion components, plasticizers, and methods of of manufacture. Several tables are included listing the different resins and giving viscosity data on plasticizers and paste formulations. Mimeographed copies of the report comprise 16 pages and sell for 50¢. Orders for the report should be addressed to the Office of Technical Services, United States Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order payable to the Treasurer of the United States.

Discuss Plastics Merchandising

PLASTICS merchandising was the theme of November 20 meeting of the Pacific Coast Section, Society of the Plas-

(*Continued on page* 548)

Scientific and Technical Activities

A.S.M.E. Rubber and Plastics Division Meeting

THE Rubber and Plastics Division of the American Society of Mechanical Engineers held two sessions on December 4 during the Society's sixty-eighth annual meeting at Chalfonte-Haddon Hall, Atlantic City, N. J., on December 1 to 5. The Division's plastics session had D. H. Cornell, of The B. F. Goodrich Co., as chairman and C. H. Slayton, of General Electric Co., as recorder; while L. K. Youse, of United States Rubber Co., and Sherman R. Doner, of Raybestos-Manhattan, Inc., acted as chairman and recorder, respectively, at the rubber session.

Plastics Session

The first paper presented at the plastics session was "Plastic Tooling Comes of Age," by Lawrence Wittman, tool development engineer, Republic Aviation Corp. Plastic tools in the form of low-pressure laminates have proved to possess a high degree of accuracy, stability, durability, and permanency, Mr. Wittman said, and result in lowered tool costs and greater utilization of unskilled personnel. The speaker forecast application of plastic tooling to industries other than aircraft as an adjunct to, or improvement over, existing methods. This point is especially true where such tools must incorporate complex shapes or contours. These tools should be of particular value for drilling, checking, and assembling fixtures in industries such as wood, plastics, metal, and automotive.

The second paper was "Major Advances in Plastics during 1947," by J. W. Underwood, administrative assistant, plastics laboratory, General Electric Co. This paper, which will be printed in full in our February issue, discussed outstanding developments in uses, methods, properties, processes, products, and equipment which took place last year in the plastics industry.

Next on the program was a paper by W. N. Findley, assistant professor of theoretical and applied mechanics, University of Illinois, entitled, "A Phenolic Molding Material under Fatigue, Impact, Creep, and Static Loads." Professor Findley presented data on macerated phenolic molding material under the following tests: static tension, compression, torsion, and flexure; long-time creep tests at different stresses; tests for time to fracture under constant loadings; Izod and Charpy impact tests; bending fatigue tests at different testing stresses; rotating beam fatigue at different testing speeds; rotating beam fatigue tests of notched specimens; and torsion fatigue tests. The speaker also gave test data showing the effect on results arising from the different variables present in each test method.

Concluding the plastics session was a symposium on non-metallic bearings. Speakers were A. Bednar, of Lucien Q. Moffitt, Inc., H. V. Twonsley, of Lignum Vitae Products Corp., L. E. Caldwell, of Westinghouse Electric Corp.; and R. D. Smeeley, of E. J. Willis Co. Mr. Bednar spoke on "Some Characteristics of Soft Rubber as the Bearing Material for Water-Lubricated Bearings." He noted that soft rubber bearing materials have been in use for about 12 years, particularly in pumps, agitators, and turbine guide bearings. The rubber bearings are particularly valuable for use in water containing silt or abrasive particles. Tests and service performance have shown that the rubber bearings deform and allow abrasive particles to pass on. Particles therefore do not become embedded in the rubber, and bearing surfaces are not scored. A further advantage is that the rubber bearings deform according to the direction and degee of loading. At high speeds, vibration of shafts is reduced because the bearings permit the shaft to turn on its axis of gyration, rather than on its geometric center.

Mr. Twonsley dealt with "Some General Information about Lignum Vitae Bearings." Lignum vitae is a hard, dense, tropical wood which contains an oily resin and has a specific gravity of 1.35. The logs are cut with standard woodworking machines, and the wood formed by conventional metalworking tools. As a bearing material, the chief characteristic of lignum vitae is that it does not require lubrication of any kind because of its gum content, although lubricants may be added to reduce further the coefficient of friction. In general, Mr. Twonsley said, design proportions for lignum vitae bearings are similar to those for Babbit metal bearings. Lignum vitae works well both for sliding or reciprocating members and for revolving members and because of its non-contamination quality is particularly useful for food handling or processing machinery. Disadvantages of the wood include non-uniformity from tree to tree and excessive thermal expansion, which confines its use to non-precision bearings. The wood does not seize, is not attacked by mild acids or brines, and is suitable for use in handling liquids containing gritty particles.

The third speaker at the symposium, Mr. Caldwell, treated of "Phenolic Bearing Materials." These bearings have directional properties, and their greatest strength in compression is parallel to the lamination. The speaker showed slides giving the physical properties of various phenolic bearing materials and pointed out that the material possesses the essential requirements of a bearing material: compatibility, stability, adaptability, and economy. The material's chief disadvantage is that allowance must be made for swelling due to absorption of lubricant when the phenolic bearing is of the closed-ring type. Applications for phenolic bearings include roll necks, ship stern tubes, ship rudder stocks, centrifugal pumps, ball mills, aircraft landing gears, and railroad bolster cup bearings.

Mr. Smeeley, concluding the symposium, spoke on "Rotating Rubber Journal Bearings for Landing Craft Propeller Shafts." He noted that these bearings were particularly effective in the silted and muddy water encountered by such craft. In these bearings the rubber is molded on a metal sleeve which is then locked on the propeller shaft. This assembly turns within the metal mating bushing, and the rubber acts as the rotating bearing member. Advantages of these bearings include continuous film lubrication, satisfactory water feed even at slow speeds, shaft conservation, and automatic sand and silt ejection.

Rubber Session

The initial paper of the rubber session was "Silicone Rubber—New Properties for Design Engineers," by George S. Irby, Jr., development chemist, Wyman Goss, group leader, and James J. Pyle, director, plastics laboratory, General Electric. This paper, illustrated with numerous slides, discussed the properties, compounding, and fabrication techniques of the GE silicone rubbers. The paper, which will be printed in an early issue of India RUBBER WORLD, showed how the properties of the rubber and its fabrication techniques affect the design of molded and extruded parts.

The second paper was entitled, "Rubber in the Automotive Industry," by Robert K. Williams, research engineer, research laboratory division, General Motors Corp. This paper was similar to the one presented by Mr. Williams before the April 22 joint meeting of the Buffalo and Ontario Rubber groups, reported in our May issue (page 222). The first part of the paper was devoted to a review of uses of rubber in the automobile, showing how each application stems from the engineering properties of rubber. The concluding section of Mr. Williams' paper was a review of the joint S.A.E. and A.S.T.M. tables of specifications for rubbers showing how these tables can be used for specifying rubber for both general-type and special-part applications.

The concluding paper of the session was the perennial review of rubber developments, entitled "Advances in Rubber during 1947" and presented by Y. A. Cosler and S. W. McCune, III, organic chemicals department, rubber chemicals division, E. I. du Pont de Nemours & Co., Inc. This review covered developments in rubber regulation by the government, industry research and development activities, and advances in tire fabrication, rubber dampeners, rubber springs, rubber to metal bonding, testing methods, evaluation of physical properties of rubber, and rubber compounding ingredients. (See page 481)

Committee Meeting

A luncheon-meeting of the executive, advisory, and general committees of the Rubber and Plastics Division was held at the Haddon Hall Hotel on December 4. J. F. Downie-Smith, United Shoe Machinery Corp., incoming divisional chairman, presided over the meeting in the absence of Chairman Henry M. Richardson, DeBell & Richardson. First business on the agenda was the Division's executive committee, and Glenn W. Neely, of Richardson Co., was added to the committee to replace Mr. Richardson who becomes a member of the advisory committee. Other executive committee members are James H. Booth, Thompson Products Co.; Mr. Downie-Smith; D. H. Cornell, Goodrich; and F. W. Warner, General Electric. Passing on to the plastic papers committee, Mr. Neely was chosen chairman for the coming year, replacing Mr. Warner. James Bailey, of Plax Corp., is the second member of this committee, and it was decided to offer the third membership to Professor Findley, or S. K. Moxness, of Minneapolis-Honeywell Regulator Co., or N. K. Nason, of Monsanto Chemical Co., in that order.

W. N. Keen, of du Pont, now chairman of the Division's rubber papers committee, will continue in that office for the coming year. The following were proposed as assistants to Mr. Keen, in that order: F. L. Yerzley, of the Mycalex Corp.; A.

V. Tobolsky, of Princeton University; and Mr. Williams. Mr. Richardson was added to the Division's advisory committee, replacing John Delmonte, of Plastics Industries Technical Institute, who became a member of the general committee. Other members of the advisory committee, which is composed of past chairmen of the Division, are Mr. Booth, E. F. Riesing, of Firestone Industrial Products Co., Mr. Yerzley, and G. M. Kline, of the National Bureau of Standards.

The following were retained as members of the Division's general committee: Mr. Bailey; C. Carmichael, Nye Rubber Co.; E. N. Cunningham, Enjay Co.; E. Householder, Firestone Tire & Rubber Co.; M. E. Lerner, editor, *Rubber Age*; Mr. Moxness; Mr. Nason; J. H. Teeple, Celanese Plastics Co.; Mr. Tobolsky; and F. J. Wehmer, Minnesota Mining & Mfg. Co. Added to the general committee were: Prof. Findley; Mr. Delmonte; R. G. Seaman, editor, India Rubber World; R. K. Witt, Johns Hopkins University; and Mr. Williams, if he is elected to the rubber papers committee.

Mr. Downie-Smith, retiring research secretary for the Division, stated that his report on rubber problems had been completed and was in process of being printed in *Mechanical Engineering*, the official A.S.M.E. journal. Dr. Kline was chosen research secretary for the coming year and will supervise work on a similar report on plastics problems. Mr. Seaman was chosen publicity chairman for the Division for the coming year, and it was decided that the papers committee chairman would send their programs for forthcoming meetings to the Division secretary, Mr. Cornell, who would in turn notify the publicity chairman.

It was also decided that the Rubber and Plastics Division would hold two sessions at the A.S.M.E. fall meeting at Erie, Pa., in September, 1948, and three sessions at the Society's sixty-ninth annual meeting in New York, N. Y., in December, 1948.

NBS High Polymer Lectures

THE 1947-48 series of lectures at the National Bureau of Standards dealing with the properties of high polymers was announced by E. U. Condon, director. The program, continuing the seminars presented for the past two years, will have leading scientists in this field from industry and university. Arranged by Robert Simha, of the Bureau's division of organic and fibrous materials, the lectures are open to the public without charge and will be held from 7:00 to 9:00 p.m. in Room 214 of the Bureau's Chemistry Building, Washington, D. C.

The program consists of eight lectures, as follows:

November 6—"Collagen Reactions and the Thermo-Lability of the Compounds Formed," E. R. Theis, Lehigh University.

November 18—"The Creep and Plastic Flow of Solid Materials," H. Eyring, University of Utah.

December 4—"Proliferous Polymerization," G. S. Whitby, University of Akron.

January 22—"Hydrolysis of Proteins," H. B. Bull, Northwestern University.

February 5—"Hysteresis of Elastomers in Cycles of Elongation; Temperature and Frequency Effects," M. Mooney, United States Rubber Co.

March 25—"Polyelectrolytes," R. M. Fuoss, Yale University.

April 29—"Size and Shape of Protein Molecules," J. L. Oncley, Harvard Medical School.

May 27—"Solution Properties of Cellulose Derivatives— Correlation with Physical Properties," H. M. Spurlin, Hercules Powder Co.

New Standard Hydrocarbon Samples

SEVEN new NBS standard hydrocarbon samples have been announced by the National Bureau of Standards, bringing to 126 the number of such compounds now available for calibrating analytical instruments and apparatus in the research, development, and analytical laboratories of the petroleum, rubber, chemical, and allied industries. These samples have been prepared as part of a cooperative program of the Bureau and the American Petroleum Institute begun in 1943.

The seven new compounds are given below:

NBS Sample No.*	Compound	Amount of Impurity† Mole %	Volume per Unit‡ Ml.
523-5S	1,2-Diethylbenzene	0.05±0.03	5
525-5S	1,4-Diethylbenzene	0.07±0.02	5
531-5S	3-Methyl-1-pentene	0.30±0.20	5
533-5S	2-Methyl-2-pentene	0.09±0.05	5
534-5S	cis-3-Methyl-2-pentene ...	0.15±0.08	5
545-5S	2,4,4-Trimethyl-1-pentene .	0.09±0.03	5
546-5S	2,4,4-Trimethyl-2-pentene .	0.08±0.05	5

*The designation "5S" indicates a sample of 5 ml. sealed "in vacuum" in a special pyrex glass ampoule with internal "break-off" tip.

†Purity evaluated from freezing point measurements, as described in *J. Research NBS*, 35, 355 (1945) RP1676.

‡Tolerance approximately ±10%.

Instructions for transferring standard samples of hydrocarbons "in vacuum" are available upon request. A complete list of NBS standard samples of hydrocarbons, together with instructions for ordering, may also be obtained from the National Bureau of Standards, Washington 25, D. C.

Smith on Carbon Black

W. R. SMITH, chief research chemist of Godfrey L. Cabot, Inc., recently delivered two talks on carbon black to groups at the University of Buffalo. The first, given December 4 before the student affiliated chapter of the American Chemical Society, was entitled "Carbon Black." Preceding the talk, there was a showing of the motion picture, "Inside the Flame," produced by Cabot and describing the manufacture and properties of channel blacks.

The second talk, "Recent Measurements on Heats of Adsorption on Carbon Blacks and Their Relation to Reinforcement," was given December 5 at a seminar attended by faculty members and chemists in the Buffalo area. Dr. Smith discussed results of an extensive investigation being conducted by Cabot on the heat of adsorption of various molecules on carbon black surfaces. These measurements reveal not only the strength with which various materials are bound to carbon surfaces, but also make it possible to describe the state of the molecules adsorbed on the surface. The experiments, when applied to the carbon-rubber system, may shed light on the problem of reinforcement, Dr. Smith said.

Buffalo Group Elects

ELECTION of officers for 1948 of the Buffalo Rubber Group took place at the Group's annual Christmas Party, held on December 9 at the Hotel Westbrook, Buffalo, N. Y. The affair, attended by 135 members and guests, comprised a cocktail hour, dinner, floor show, and distribution of favors and door prizes. A vote of thanks was given by the assemblage to the 40-odd rubber manufacturing and supplier companies whose contributions made possible the prizes and entertainment.

The following officers were elected, as chosen by the nominating committee and approved by the Group: chairman, E. R. Briggs, Hewitt-Robins, Inc.; vice chairman, Wayne Nelson, American Container Corp., secretary-treasurer, R. E. Schultz, U. S. Rubber Reclaiming Co.; and executive committee, A. H. Davis, Dunlop Tire & Rubber Corp., E. C. Siverson, Buffalo Weaving & Belting Co., H. J. Deney, Pierce & Stevens, Inc., Burt Wetherbee, Wetherbee Chemical Co., Wilbur F. Parsons, Carborundum Co., R. F. Thom, Hewitt-Robins, and John Augenstein, U. S. Rubber Reclaiming.

New Resin Alcohol

COMMERCIAL production of a new low-cost resin alcohol made from rosin, which has potential application in the rubber, adhesive, textile, detergent, paint, and other industries, has been announced by Hercules Powder Co., Wilmington, Del. Called hydroabietyl alcohol, the product is said to be the first commercially available primary alcohol to be developed from rosin.

Hydroabietyl alcohol is a colorless, viscous, tacky liquid which is immiscible with water. Of all rosin derivatives it is the most resistant to discoloration or degradation by light or air. This alcohol, moreover, is subject to esterification with both organic and inorganic acids and can be etherified. It is miscible with esters, alcohols, ketones, ethers, hydrocarbons, and chlorinated hydrocarbons and is compatible with many film-formers and resins used in protective coatings, adhesives, and other products.

The material can be used without modification as an addition agent for chlorinated rubber, polyamides, hydrogenated oils, textile sizes, rubber compounds, and essential oil vehicles. By chemical reaction it can yield a wide variety of products, such as resins, foamers, wetting agents, emulsifying agents, plasticizers, antioxidants, and others. Commercial production of hydroabietyl alcohol will be carried out in a unit of Hercules' new plant at Burlington, N. J.

Accelerator Price Reduction

AN ADJUSTMENT in the price of its accelerator, S.A. 62-0 (tetraethylthiuram disulfide), was recently announced by Sharples Chemicals, Inc., 123 S. Broad St., Philadelphia 1, Pa. Formerly priced at $1.25 a pound, the accelerator will sell at $1.00 a pound effective January 2. According to the announcement, this price adjustment is based on the activity of the material compared to other accelerators on the market.

Chemical Exposition Forecasts Industrial Growth

RECORD business volume for 1948 and rapid industrial growth reaching several years ahead were forecast by exhibitors at the Twenty-First Exposition of Chemical Industries held December 1 to 6, at Grand Central Palace, New York, N. Y. Comprised of more than 400 exhibits and occupying four floors of the Palace, the show was attended by more than 50,000 visitors from practically every state in the union and from many foreign countries. As in preceding shows, displays of processes and equipment made up the major portion of the exposition. New chemical products were relatively few, but commercial quantities were being offered of many chemicals hitherto available only in laboratory and pilot-plant quantities. Record volumes of orders for scarce chemicals, containers, and machinery were placed, and many of the exhibitors reported that these orders were being received from new accounts.

Exhibitors said that a seller's market for many important chemicals and processing equipment lines will continue into 1948, despite large-scale increases of capacity at new plants throughout the country. Foreign chemical engineers attending the show revealed plans for enlargement of foreign chemical, glass, and food-packing plants. Many of these foreign orders will be delayed by "processing", exhibitors said, unless backed by better cooperation from governmental agencies to expedite approvals of chemicals and equipment sales to buyers from devastated European areas.

In a discussion of industry-wide trends for the coming year, a group of exhibitors forecast: (1) improved supply of many scarce products, but continued overall scarcities; (2) increased up-grading of technical sales and marketing in both the chemical and equipment industries; (3) increased customer research services coupled with expanded laboratory research to buyers; (4) extensive new building activities thoughout the industry, with possible use of many now idle government plants; and (5) increased personnel in specialized selling and engineering fields.

Chemical Exhibits

American Resinous Chemicals Corp. displayed resins, emulsions, latex compositions, and resin dispersions for use in laminating, impregnation, and coating work. Be Square special waxes, many of which are suitable for use by the rubber industry, were shown by Bareco Oil Co. The display of Bakelite Corp. featured unbreakable polyethylene bottles in addition to illustrations of the many applications of their various plastics materials. A full line of solvents was shown by Commercial Solvents Corp. Davison Chemical Corp.'s exhibit featured chemical catalysts, silicofluorides, alum, asphalt compounds, and dehydration materials. Diatomaceous silicas for use as fillers, filter aids, insulation, and absorbents were shown by Dicalite Co. Materials for industrial insulation featured the Eagle-Picher Co. display, which included cements, fillers, pipe coverings, protective coatings, and other products for high and low temperature use. Photographic equipment and materials comprised the major part of the General Aniline & Film Corp. exhibit, but dyestuff intermediates, wetting agents, textile chemicals, Koresin, and other chemicals were also on view.

Glyco Products Co. displayed fatty acid derivatives, including several new products of particular interest to the food industry. Cellulose products, terpene solvents and chemicals, rosin and rosin derivatives, paint and varnish materials, and synthetic resins were shown by Hercules Powder Co., which also featured its new rosin derivative, hydroabietyl alcohol. Celite filter aids and mineral fillers were displayed by Johns-Manville Corp., in addition to insulating bricks and cements. Koppers Co. exhibited many chemicals now available in commercial quantities, including the diamyl phenols, of interest to the rubber industry; while Sharples Chemicals, Inc., displayed accelerators and other rubber chemicals. A full line of petroleum products, including rubber softeners and lubricants, was shown by Socony-Vacuum Oil Co. Lines of chemicals available in both research and commercial quantities were displayed by Reichhold Chemicals, Inc., and Union Carbide & Carbon Co. Tygon paint and tubing featured the display of United States Stoneware Co., which also included processing equipment for the chemical industries.

Processing and Equipment Exhibits

A full line of basic chemical processing machinery was shown by Allis-Chalmers Mfg. Co., including grinders, mills, drives, pumps, furnaces, extraction, and other equipment. American Hard Rubber Co. and Luzerne Rubber Co. exhibited hard rubber goods, including valves, piping, and special equipment. New valves made of nickel-chrome alloy were shown by Alloy Steel Products Co. The exhibit of Baker Perkins, Inc., featured the new B-P masticator for compounded plastics and rubber, unveiled for the first time at the exposition. Pilot-plant varnish and resin plants, complete in one packaged unit, were on display by Blaw-Knox Co.; and laminated plastics parts for processing equipment were shown by Continental Diamond Fibre Co.

Filtration Engineers, Inc., displayed new filters available in various synthetic fibers for use in pilot-plants. A complete line of rubber gaskets and packings was shown by Garlock Packing Co. Corrosion-resistant pipe, valves, pumps, tanks, agitators, and other processing equipment were exhibited by Haveg Corp. A line of rubber, Koroseal, lead, vinyl, ceramic, phenolic, and metallic tank linings were the specialties of Heil Process Equipment Corp. Chemical pumps of many types were displayed by LaBour Co.; and Lukens Steel Co. featured labyrinth-type steam platens, available in a wide variety of designs to meet special service requirements. Mine Safety Appliances Co. displayed boots, rubberized clothing, goggles, gas masks, and other safety appliances. National Carbon Co. showed its Karbate pipes, coolers, pumps, and other heat-transfer equipment. Applications of lead in the chemical processing industry were displayed by National Lead Co.

Filters for the chemical, food, fermentation, and process industries were exhibited by Niagara Filter Corp. The use of Fiberglas in electrical and thermal insulations was shown by Owens-Corning Fiberglas Corp. Tube fittings, valves, and hose assemblies were exhibited by Parker Appliance Co.; while Photoswitch, Inc., displayed an extensive range of photoelectric counters and switches. Stanzoil rubber industrial gloves were featured by Pioneer Rubber Co. Colloid mills were shown by Premier Mill Corp., including models particularly suited for latex and rubber cements. Pumps and liquid proportioning equipment were displayed by % Proportioneers, Inc. %. Pulverizing Machinery Co. featured its new Mikro-Collector for removal of dusts and other air-borne particles from chemical plants. A new high-speed vertical mill of wide application attracted attention for the Raymond Pulverising Division, Combustion Engineering Co. An extensive line of variable speed controls was shown by Reeves Pulley Co., and the exhibit of John A. Roebling's Sons Co. included rubber-covered wires and cables.

The Constametric pump, a new reciprocating-type pump said to provide constant controlled flow without pulsation, was introduced by Milton Roy Co. Panelyte filter plates and decorative laminates were shown by Panelyte Division, St. Regis Sales Corp. Sarco Co., Inc., displayed steam traps, pipe line strainers, temperature regulators, inlet valves, and water blenders. A complete line of presses for the rubber, plastics, and other industries was exhibited by F. J. Stokes Machine Co., and Sturtevant Mill Co. showed crushing, milling, and mixing equipment. The display of Foster D. Snell, Inc., featured products illustrating its consultant and testing services. Laboratory and process instruments were well represented at the exposition and included the exhibits of American Instrument Co., Baker Instrument Co., and Cambridge Instrument Co., among others.

GR-S for Consumer Goods

THE annual Christmas party of the Boston Rubber Group took place on December 12 at the Somerset Hotel, Boston, Mass., with approximately 400 members attending. The annual election was held, with the following results for the coming year: chairman, Richard K. Patrick, Vulplex, Inc.; vice chairman, Bernard H. Capen, Tyer Rubber Co.; secretary-treasurer, Harry W. Sutton, Boston Woven Hose & Rubber Co.; and executive committee, Charles E. Reynolds, The Odell Co., Thomas C. Edwards, Acushnet Process Co., and Ralph McCurdy, Hood Rubber Co. Harold P. Fuller, Pequanoc Rubber Co., will continue as permanent historian of the Group.

After a cocktail hour and dinner, William F. Tuley, of Naugatuck Chemical Division, United States Rubber Co., spoke on "GR-S in Consumer Products." General-purpose synthetic rubber is progressing from the status of a substitute material to that of an established commodity used because of its cost and quality values, Dr. Tuley said, and this attitude toward GR-S will also soon be adopted by consumers. There are now more than 400 experimental GR-S latex and dry rubber polymers approved by Rubber Reserve, and nearly 40 of these are in regular production. These different variations of GR-S represent progress in providing a material which can be handled satisfactorily in manufacturing operations to produce a quality product.

The improved types of GR-S presently available do not give great improvements in the properties of abrasion resistance, heat build-up, and flex cracking which have been deficient in comparison with natural rubber in performance in large-size tires. Certain developments now nearing commercial application give promise of such an improvement that synthetic rubber may surpass natural rubber in durability in first-quality tire treads, the

speaker said. GR-S continues to be used in substantial quantities in non-transportation rubber products despite removal of natural rubber restrictions. Presently available GR-S types will continue to be used as part of all of the new rubber hydrocarbon in insulated wire, footwear, sponge rubber, flooring, and many other industrial and consumer products. This practice is proof of the acceptance of GR-S by industry and the public because of its quality, uniformity, and stable price. There can no longer be any question of the value of GR-S when its use is directed by intelligent and skilled technology, Dr. Tuley concluded.

Following the paper, an excellent floor show was presented, and prizes were awarded holders of lucky numbers. It was announced that the paid membership of the Group now totals 651.

Officers for 1948

THE annual Christmas party of the New York Rubber Group was held December 12 at the Hotel McAlpin, New York, N. Y. A cocktail party at 5:30 p.m. preceded the dinner held at 6:30. Next came a short business session and election of officers, after which entertainment in the form of five acts of vaudeville was presented. Audience participation in this part of the program both solicited and unsolicited was very active, indicating the interest of the audience in the features provided. Attendance totaled about 450 members. P. L. Wormley, of the National Bureau of Standards, was a special guest of Chairman Simon Collier at the speakers' table. The evening was concluded with the distribution of 134 very worthwhile prizes to the holders of lucky numbers. These prizes were made possible by contributions from 80 companies and individuals in the rubber and associated industries.

New officers of the Group for 1948 are: chairman, J. E. Waters, General Cable Corp.; vice chairman and chairman of program committee, Peter P. Murawski, E. I. du Pont de Nemours & Co., Inc.; secretary-treasurer, Peter P. Pinto, *Rubber Age;* and sergeant-at-arms, H. G. Ling, Naugatuck Chemical Division, United States Rubber Co.

Elected to the executive committee for three-year terms were: G. A. Provost, U. S. Rubber; M. R. Buffington, Lea Fabrics; John M. Hamilton, Binney & Smith Co.; and A. S. Corrigall, R. T. Vanderbilt Co. Elected for a two-year term was A. E. Powell, Pioneer Latex & Chemical Co., and for a one-year term, B. M. Fairbank, General Electric Co. Mr. Collier, retiring chairman, and B. B. Wilson, retiring secretary-treasurer, are *ex-officio* members of the executive committee.

At a meeting of the executive committee held in the afternoon Chairman Collier reported on the excellent work of the committee on arrangements made up of New York Group members during the fall meeting of the Division of Rubber Chemistry, A. C. S., which was held in New York in September and thanked those members who had participated. It was voted to increase the executive committee of the Group from nine to twelve members, with four members serving during each of the one-, two-, and three-year terms. The larger executive committee should result in a larger attendance at committee meetings and more effectively

J. E. Waters

serve the interests of the nearly 900 members of the Group.

It was urged that the committee on the history of the Group complete its work at an early date since the year 1948 will mark the twentieth anniversary of the organization which was founded in 1928.

The report of the nominating committee, consisting of George J. Wyrough, chairman, E. S. Kern, E. A. Schwartz, and B. B. Wilson, was read prior to its presentation to the membership at the regular business meeting. It was voted that the outgoing chairman be made chairman of the nominating committee for the following year because of his familiarity with the activities of the various members. It was also voted that officers and members of the executive committee be selected from those in the New York Metropolitan Area and that in no case should such officers and members hold officers in other local rubber groups during their term of office in the New York Rubber Group.

Rubber Division Activities

H. I. CRAMER, vice chairman, Division of Rubber Chemistry, A. C. S., has recently provided some additional information on the activities of the Division for the year 1948. Mention was made of the spring meeting to be held in Chicago, Ill., April 21-23, in conjunction with the one hundred thirteenth meeting of the American Chemical Society. Division headquarters will be the Sherman Hotel. Robert C. Dale, vice chairman of the Chicago Rubber Group, is chairman of the local committee on arrangements.

The time and the place of the fall meeting have not been definitely settled. The A. C. S. will hold divided meetings, one in Washington, D. C., August 29 to September 1; one in St. Louis, Mo., September 6 through 10; and one in Portland, Oreg., September 13 through 17. The Rubber Division would normally meet with the Eastern Section in Washington, but the executive committee of the Division has decided rather to meet separately, and the Fall 1948 meeting will accordingly have to be held after October 1. Detroit, Mich., has been selected as first and New York, N. Y., as second choice of the executive committee for the meeting place.

The Division received an invitation from the Los Angeles Rubber Group to hold one of the 1948 meetings in that city, but the executive committee felt impelled because of the great traveling distances involved to decline this invitation. The possibility of holding a regional meeting in Los Angeles is being investigated, however, and if sufficient papers appear to be forthcoming, there is a good possibility that such a meeting will be scheduled for some time between June 1 and August 1, 1948.

The Charles Goodyear Medal for 1948 will be awarded to George Oenslager, formerly of The B. F. Goodrich Co. The presentation will be made as a part of the program of the Divisional banquet, April 22, 1948, in Chicago.

The Rubber Division will observe its twenty-fifth anniversary this year. In recognition of this fact, the Chicago Rubber Group has proposed the formation of a 25-Year Club. The chairman of the Division has appointed a committee of H. A. Winkelmann, chairman, W. W. Vogt, and S. Collier, to formulate plans for such a club.

Another project of the Rubber Division for 1948 is the publication of a directory of its membership, which will be issued early in 1948.

Health and the Rubber Chemist

NINETY-FIVE members and guests of the Philadelphia Rubber Group attended a meeting on December 5 at Kugler's Restaurant, Philadelphia, Pa. A short executive committee meeting was held prior to the regular meeting. The report of the nominating committee was presented, and the slate of officers approved, as follows: chairman, W. B. Dunlap, Lee Tire & Rubber Co.; vice chairman, W. F. Abbey, Firestone Tire & Rubber Co.; secretary-treasurer, T. J. Gorman, Quaker Rubber Co.; directors elected for three years, G. Wyrough, Phillips Petroleum Co., and F. H. Perrine, Thiokol Corp.; directors with unexpired terms, F. M. Galloway, Quaker Rubber, and E. H. Grafton, West Co.; and directors appointed to fill unexpired terms, R. Kurtz, E. I. du Pont de Nemours & Co., Inc., and C. Hellman, H. N. Richards Co.

Speaker at the regular meeting was F. W. Sands, of United States Rubber Co., whose topic was "The Rubber Chemist in Health Protection." Mr. Sands reviewed the history and development of industrial hygiene, with particular reference to the rubber and chemicals industries. Rubber chemists are represented on the Committee for the Standardization of Rubber Protective Equipment, the Committee on Toxic Dusts and Gases, and the Labeling Code Committee of the Manufacturing Chemists' Association. A Subcommittee on Rubber Chemicals was recently formed to study the problem of proper labeling of rubber chemicals on an industry-wide basis. Other things which can and should be done, Mr. Sands emphasized, include: (1) establishment of plant committees by the individual companies to review periodically all chemical raw materials used in the plant and all process changes which may affect employe health; (2) constant alertness by the chemist to avoid exposure to toxic solvents; (3) proper labeling of chemicals used within the plant and products sold; and (4) suitable research programs to obtain adequate toxicological and physiological data on new chemicals and new products.

Hatsch, of Polymer, Discusses European Rubber Industry

THE Ontario Rubber Section, C.I.C., held a meeting on December 9 at the Hart House, University of Toronto, Toronto, Ont., Canada. An attendance of 45 members and guests heard Roger E. Hatsch, of Polymer Corp., speak on the "European Rubber Industry." Mr. Hatsch spent eight months in Europe during 1947 and visited most of the rubber plants in Czechoslovakia and Western Europe.

The Scandinavian countries are comparatively well off, the speaker said. General conditions in Norway are good, and reconstruction of industry is proceeding at a rapid pace. Norway's normal rubber consumption is about 3,000 tons a year. One group, Askim Gummivarefabrik, consumes about 80% of this total and is the only tire producer in the country, in addition to producing footwear and mechanical goods. The company's technical staff is sound and progressive and has a technical information agreement with the Dayton Rubber Co. in the United States. The industry is generally quite interested in the development of synthetic rubbers, and some of the companies are using limited quantities of GR-S on a regular basis. Butyl tubes are being produced experimentally and are being tested. Last winter's tests in Norway gave much less difficulty with Butyl tubes than has been encountered in Canada, Mr. Hatsch declared.

Living conditions in Sweden, although lowered during the past year, still rank high in Europe. In the rubber field the "Big Four" United States rubber companies control the market, either through direct subsidiaries or in partnership with Swedish firms. The only large independent company is Tretorn, a footwear producer. Most Swedish plants are expanding their production substantially to take care of the market formerly supplied by Germany. Sweden's total rubber consumption is about 7,000 tons a year. Some synthetic rubber is being used on a regular basis, especially by the mechanical goods and wire and cable people, the speaker stated, and these industries are very interested in the latest developments.

Finland is in a poor economic position because of war reparations to Russia. Her rubber industry is controlled by the Finske Gummifabrik, whose two plants consume 85% of Finland's total annual rubber consumption of about 3,000 tons. The company's Tammerfors plant in northern Finland has used synthetic rubber and is interested in the various types. Because of her dollar scarcity, Finland is now receiving Buna made in German plants in the Russian zone.

The fourth Scandinavian country, Denmark, has her industry up to prewar production efficiency, but capacity is generally sufficient only for domestic demand. Denmark's rubber industry is limited, but active, although no companies produce auto tires on other than an experimental basis. Bicycle tires and tubes are the chief rubber products. Of the total rubber consumption of about 2,000 tons yearly, Dansk Galoche and Schionning & Arve consume about 75%; while wire and cable firms account for the balance.

Although Holland was ravished by the war, rebuilding there is progressing rapidly. The Dutch rubber manufacturing industry was never particularly strong, Mr. Hatsch explained, and most production has been limited to bicycle tires and tubes. Just recently, however, the Vredestein company, which is affiliated with Goodrich, has started production of auto tires. Michelin has also built a small plant and will produce cycle tires and tubes. The rubber plants suffered during the war, and most are now being modernized. Some GR-S is being used, and Butyl experimental work is being carried on in both the tube and the wire and cable industries. The greatest handicap to increased use of synthetic rubber is the Dutch dollar shortage, since natural rubber can be bought for Dutch guilders. Despite this fact, GR-S was purchased even when the price of natural rubber was at the yearly low.

Belgium has made a remarkable industrial recovery and is operating at peak capacity, the speaker went on. Her rubber industry is dominated by the Englebert company, which consumes about 35% of Belgium's total consumption of 7,000 tons annually. Two French firms, Michelin and Bergougnan, also have plants, and Pirelli operates a general rubber products plant. Most of the plants are quite old, but show a keen interest in synthetic rubber, for which they are found to be good customers.

Consumption of rubber in France during 1946 was 58,000 tons, of which 29,000 tons were synthetic rubber. The total consumption for 1947 is expected to be nearly 75,000 tons, Mr. Hatsch said, of which about 13,000 tons will be synthetic. Consumption in 1948 is expected to increase by about 10%, with synthetic rubber levelling out at about the 1947 figure. The largest consumer is the Michelin company, which produces only tires and tubes. Other large consumers are Dunlop, Kleber (formerly Goodrich), Bergougnan, Englebert, Hutchinson, and Renault. These firms consume about 58,000 tons a year. The French rubber industry, in general, is well equipped and actively interested in synthetic rubber developments. One company has a pilot-plant producing synthetic rubber of various types and is doing fundamental work on polymerization.

Switzerland's rubber industry is comparatively small. The Firestone plant near Basle is the largest in the country and the greatest producer of auto tires and tubes. This plant uses about 40% of Switzerland's total yearly rubber consumption of 3,500 tons. Several other plants produce a variety of mechanical goods, bicycle tires and tubes, and footwear. The Swiss plants are generally very modern and well run. Both GR-S and Butyl have been used, and substantial quantities of synthetic rubber are still being used.

The rubber industry in Italy consists of three big companies, the largest of which is Pirelli. This company, manufacturing all types of rubber products including wire and cable, uses about 60% of Italy's total consumption of about 20,000 tons a year. Of this total, about 20% was GR-S in 1947. Besides the parent company, there are a great number of smaller firms either directly or indirectly controlled by the Pirelli group. The second largest company is a subsidiary of the French Michelin firm, and the third largest is a subsidiary of the French Hutchinson company. Smaller companies total about 150 in number, and most possess only two mills and a couple of curing presses. The Italian rubber industry has consumed substantial quantities of synthetic rubber, much of which has been supplied by Polymer. Most of the large companies are well staffed and interested in new developments, particularly in Butyl rubber. Although none of the Italian companies is producing Butyl on a large scale, much has been purchased, and many Butyl products are being made experimentally.

Czechoslovakia's total rubber consumption is about 15,000 tons a year, and all the major rubber factories are nationalized. The Bata factory at Zlin, which makes all types of rubber articles, consumes about 60% of the total rubber. The old Michelin plant, now nationalized under the name of Mitas, manufactures tires and tubes and consumes about 12%. Most of the remaining rubber is used by four other plants. Purchases of raw rubber are made through Kotva, the nationalized import-export group formerly the Bata import-export agency. Czechoslovakian firms have been using large quantities of GR-S, but at present, because of dollar shortages, are using mainly Buna from the Russian zone in Germany. These firms are interested in new developments, especially in Butyl tubes. Butyl inner tubes and curing bags have been produced by many of these companies.

In England the greatest rubber consumers are the Dunlop plants, although subsidiaries of United States and Continental companies have large plants producing all types of rubber goods. Because of the dollar shortage, the companies are using nearly all crude rubber, although some GR-S is in consistent use. English rubber technologists are convinced that synthetic rubbers have a future, Mr. Hatsch said, and are determined not to be left behind in developmental work.

"Ten Ablest" in Rubber

THE Chicago Section of the American Chemical Society through its publication, *The Chemical Bulletin*, recently conducted a poll of its readers to determine by this method the "ten ablest chemists or chemical engineers" working in the United States in 20 different fields including rubber and plastics. As *The Chemical Bulletin* comments editorially: "So far as we know, this is the first time chemists and chemical engineers have received public recognition based entirely on fellow-specialists' appraisal of their scientific work."

The Chicago Section publication also points out that the present selection is not meant to disparage in any way the honor of election to divisional and other Society offices. It seems extremely important, however, to have occasional recognition based purely on scientific ability, it adds.

The ten men selected in the rubber field are all well known to most of the readers of India RUBBER WORLD as well as the rubber industry itself. We will record here the names and affiliations of these men; then in the course of the next few months we will present a separate biographical sketch of each one of them. In this way we can provide a more complete description of the abilities and achievements of these men for those who are not familiar with all such details and at the same time add further to the honor that they have recently received.

The "ten ablest" in rubber according to *The Chemical Bulletin* poll are: J. T. Blake, Simplex Wire & Cable Co.; R. P. Dinsmore, Goodyear Tire & Rubber Co.; A. R. Kemp, Bell Telephone Laboratories; George Oenslager, consultant; L. B. Sebrell, Goodyear; W. L. Semon, The B. F. Goodrich Co.; J. N Street, Firestone Tire & Rubber Co.; H. L. Trumbull, Goodrich; G. S. Whitby, University of Akron; and Ira Williams, J. M. Huber Corp.

Among those honored in other fields were were: E. A. Hauser, Massachusetts Institute of Technology, colloid chemistry; H. A. Bruson, Rohm & Haas, P. J. Flory, Goodyear, H. Mark, Brooklyn Polytechnic Institute, and P. O. Powers, Battelle Memorial Institute, paint, varnish and plastics chemistry.

Christmas Fete at Detroit

THE annual Christmas party of Detroit Rubber & Plastics Group, Inc., was held jointly with the Detroit Section, Society of Plastics Engineers, on December 12 at the Detroit-Leland Hotel, Detroit, Mich. Approximately 275 members and guests of both groups attended the party, which featured an excellent dinner and floor show. J. P. Welsh, the "Old AAA Traveler" of the Automobile Club of Michigan, also entertained the assemblage by relating unusual experiences gathered in more than 35 years of travel. Well known as a newspaperman, magazine writer, and radio commentator, Mr. Welsh has made a collection of intimate and rare stories of little known oddities, bizarre places, and picturesque personalities. The meeting closed with the distribution of a large number of prizes, made available through donations received from 60 rubber manufacturing and supplier companies.

J. P. Wilson, retiring chairman of the Detroit Group, announced the nomination of the following officers, all of whom were elected for the coming year: chairman, C. W. Selheimer, United States Rubber Co.; vice chairman, W. F. Davies, Kaiser-Frazer Co.; treasurer, E. J. Kvet, Baldwin Rubber Co.; secretary, J. C. Dudley, Chrysler Corp.; membership committee chairman, G. F. Lindner, Minnesota Mining & Mfg. Co.; program committee chairman, G. M. Wolf, Sharples Chemicals, Inc.; publicity chairman, T. Halloran, Chemical Products Co.; and executive committee, J. B. Wilson, Ford Motor Co., R. J. Shroyer, R. T. Vanderbilt Co., A. C. Nixon, Fisher Body Division, General Motors Corp., F. Haushalter, Firestone Tire & Rubber Co., and G. Horsfull, American Cyanamid Co.

Diamyl Phenols Available

KOPPERS CO., INC., Pittsburgh, Pa., has announced that diamyl phenols are now available from its chemical division. Produced at its Oil City, Pa., plant, the material is the first of a series of alkylated aromatic compounds scheduled for production. The diamyl phenols, as now produced, are a mixture of the isomers of the diamylated phenols. The amyl constituents include both secondary and tertiary groups attached mainly in the 2,4-positions. The material is an oily, light straw-colored liquid miscible in both aliphatic and aromatic hydrocarbons and essentially insoluble in water and in 10% aqueous solutions of alkali hydroxides.

Although insoluble in dilute aqueous alkalies, the phenolic hydroxyl group will undergo typical reactions, such as acetylations and reaction with ethylene oxide. Oily condensation products are also formed by reaction with formaldehyde. The new product is suggested for use in the production of plasticizers, rubber chemicals, modified phenolic resins, synthetic detergents, oil additives, and pharmaceuticals.

Chicago Group Meeting

SOME 123 members and guests of the Chicago Rubber Group attended a dinner-meeting on November 21 at the Morrison Hotel, Chicago, Ill. Speaker of the evening was B. M. Sayre, president of Benedict M. Sayre & Co., who discussed "Managerial Control Tools for Profit." Mr. Sayre stressed the importance of good bookkeeping in industry, particularly in determining the true costs of manufactured products. Determination of cost figures based on averages of direct and indirect costs over a period of time is usually misleading and does not present the proper picture to management, the speaker said. Costs calculated on a variable basis where the indirect costs are broken down into time costs and variable costs are more reliable and accurate. After citing examples of both types of bookkeeping, the speaker emphasized the importance of accurate cost figures in meeting competition.

R. L. Stapleton and L. M. Glassner, both of the Chicago Technical Societies Council, of which the Group is a member, were present and outlined the functions of the Council. They extended an invitation to the Group to participate in the March, 1948, Chicago Technical Conference. A committee under H. A. Winkelmann is studying a proposal for the Group to sponsor a panel session at this conference.

The meeting adjourned after viewing motion pictures showing highlights of games played during the 1946 football season by the Chicago Bears and Chicago Cardinals.

New Officers Inducted

NEW officers of the Los Angeles Rubber Group, Inc., were installed at the annual Christmas Party on December 2 at the Mayfair Hotel, Los Angeles, Calif. The 1948 officers follow: chairman, Phil Drew, Goodyear Tire & Rubber Co.; associate chairman, C. H. Churchill, Sterling Rubber Products Co.; treasurer, Jack Ballagh, Patterson Ballagh Co.; secretary, Tway W. Andrews, H. M. Royal Co.; and directors, B. D. Abbott, C. P. Hall Co., Robert L. Short, Kirkhill Rubber Co., and George R. Steinbach, Atlas Sponge Rubber Co.

Following introduction of new members to the Group, the evening was given over to a program of entertainment, including musical and vaudeville acts, and the awarding of prizes to members and guests.

New Goodrich Herbicides

TWO new developments in the fields of agricultural and horticultural chemistry have been announced by B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, O. The new materials, sodium isopropyl xanthate and allyl mixed chlorophenyl carbonate, classified as herbicides, have been tested by federal and state agricultural stations and have shown excellent results against many of the weeds and grasses not economically or satisfactorily controlled by other chemicals.

Sodium isopropyl xanthate is a complete killer and cannot be applied directly to growing plants. It shows promise for pre-emergence treatment in spray or dust form for the elimination of weeds from potential planting areas and has been used successfully for the chemical weeding of growing crops. It is potentially useful as a vine killer and may also be used in dormant sprays applied during the non-growing season. Allyl mixed chlorophenyl carbonate is a selective killer, particularly useful against certain types of grasses, such as crab, barnyard, orchard, blue grass, cattails, and similar plans. It will also complement the famous 2-4-D weed killer for action against some broadleaved weeds unaffected by conventional dosages of 2-4-D. Both new materials are being applied in active experimental programs and are not presently available commercially.

Philprene Synthetic Rubbers

TWO new types of synthetic rubber, Philprene A and Philprene B, are being produced on pilot-plant scale by Phillips Petroleum Co., Bartlesville, Okla. According to the announcement by Frank Phillips, chairman, and K. S. Adams, president, the new rubbers are butadiene-styrene copolymers and are manufactured in water emulsions at temperatures considerably lower than those used in making standard GR-S.

Tire and mechanical goods manufacturers who have tested experimental quantities of Philprene A report wear and cracking resistance superior to either natural or GR-S rubber. In addition, experimental tires having treads made from Philprene A have been tested by Phillips and have shown exceptional wearing qualities. The chief advantages of Philprene B include high tensile strength, resistance to cracking, and low heat build-up. Although suitable for tire treads, Philprene B is expected to find its principal application in tire carcasses.

In their liquid or latex form, the Philprenes are said to show great promise for use in industry as a partial replacement for natural rubber latex. Estimated plant production costs of Philprene A are approximately the same as for regular GR-S, and Philprene B costs are expected to be only slightly higher.

Electric Heat for Plastics

THE Quebec Rubber & Plastics Group held a meeting on December 18 at the Ritz Carlton Hotel, Montreal, P. Q., Canada. J. S. Reid, industrial heating engineer of Canadian General Electric Co., Ltd., was guest speaker at the meeting and discussed "Electric Heat in the Plastics Industry."

Mr. Reid's talk was divided into two parts. The first part was devoted to process heating, such as the heating of dies, molds, varnish kettles, etc. Under this heading the speaker discussed such equipment as immersion heaters, strip heaters, cartridge heaters, infra-red equipment, control panels, and thermostats. Electric steam generators using immersion heaters as a source of heat were also briefly mentioned. Reactrol control, whereby the voltage is varied in response to the demand of the load, was discussed, and particular reference was made to the straight-line control of Dowtherm heating systems in the resin industry.

The second part of the talk covered heat-

(Continued on page 518)

RUBBER WORLD
NEWS of the MONTH

Highlights—

Final hearings on rubber legislation were held in Washington, D. C., for about two weeks in early December. Although there was agreement on most major issues, the problem of the timing of the disposal of the synthetic rubber plants to private industry was apparently going to be the hardest one for the Congressmen to solve. Immediate disposal was strongly recommended by one industry group, and continued government ownership was just as strongly recommended by another. Year-end statements by rubber industry executives were optimistic for high production and sales of rubber goods during 1948. The URWA union indicated that it was planning to make a demand for a third round of wage increases to compensate for the increase in the cost of living.

Rubber Bill Hearings Concluded; 1948 Industry Outlook Held Good

The hearings before the Shafer House Armed Services Subcommittee on rubber were resumed in Washington, D. C., December 1 and continued for about two weeks. Leaders in the rubber and associated industries presented their views, and although there was a considerable measure of agreement on major points, a divergence of opinion appeared with regard to the disposal of the synthetic rubber plants. One group contended that the plants should be disposed of to private industry immediately; while another group held that such disposal "should be deferred until security pressures have been relieved and a program for complete disposal developed."

The U.S.-U.K. trade agreement on rubber, which was negotiated at Geneva, Switzerland, recently, was suspended upon the request of the United Kingdom. The British objections were centered around the use of reclaimed rubber in arriving at total rubber consumed in the United States. This figure was to be used in determining whether or not the United States would qualify for reductions in margin of preference for goods exported to British colonial areas.

Year-end statements by industry spokesmen were very optimistic with regard to the outlook for 1948. Demand continues extremely high for all types of rubber products. Tire production is estimated at about 85% of the 100 million casings made in 1947. Mechanical goods capacity has been expanded to meet increased demand, and footwear is expected to have a good year. Foam rubber production may hit its stride in 1948. Attention was called to the performance of holding down prices in the face of higher labor, material, and transportation costs.

Shafer Committee Hearings

In the December issue we were able to provide a brief summary of some of the statements made before the House Armed Services subcommittee on the subject of rubber policy that were made at the hearings which began in Washington on December 1. Some further details have become available and will be reported herewith.

The recommendations of The Rubber Manufacturers Association, Inc., as presented by A. L. Viles, included five basic recommentations as recorded last month In a discussion of these recommendations the elements of strategic tonnage, ownership, and operation of synthetic rubber facilities, research and development, method of assuring synthetic rubber consumption, and the source and type of government administration were covered more fully. "Suggested Recommendations from the Rubber Manufacturing Industry As to Policy on Rubber Legislation—Report of Manufacturers on the Munitions Board Industry Advisory Committee" was the full title of the report.

Data were presented based upon estimates of supply and requirements for the period between March 31, 1948, and March 31, 1949, to show that there is a sharp change in the quantitative security aspect in rubber considering synthetic consumption at current rates. If an emergency began on March 31, 1948, the estimated five-year emergency requirements would be met provided 387,000 long tons of natural rubber were imported during the emergency. If the emergency began one year later, on March 31, 1949, the imports during an emergency would need to be only 88,000 tons. If by March 31, 1949, a stockpile of GR-S of like amount had been accumulated, no imports of natural rubber would be necessary during an emergency. After March 31, 1949, if GR-S consumption were reduced to as low as 100,000 long tons a year, natural rubber or GR-S stockpile would have to be increased by 230,000 long tons in order to provide for emergency rubber requirements, provided no imports of natural rubber were expected during the emergency.

It was pointed out that in industry's opinion these estimates substantiate its recommendation that the enabling legislation should extend one year to March 31, 1949. At this time the strategic aspects from a quantitative standpoint should be nearly satisfied. By then, further study should show what minimum synthetic consumption should be continued thereafter in order to maintain a technically advanced and rapidly expansible industry. Until that time production of GR-S at a high rate and stocking by government of any surplus created thereby will provide the GR-S that might prove necessary in event of an emergency. Also, since the figures are based upon estimates, the real natural rubber stockpile requirements and achievement will be clearer late in 1948 and early in 1949.

In addition to recommending that the National Security Resources Board be given the responsibility for the disposal of the synthetic rubber plants, the RMA emphasized that provisions should be made for a well-defined accounting procedure to be used by the Office of Rubber Reserve of RFC responsible for the operation of government owned plants for making GR-S, Butyl, and plants for making raw materials, in establishing realistic and fair costs for the products of these plants. The rubber manufacturing industry believes that for this purpose an accounting procedure should be adopted, which in effect follows the method adopted for five-year amortization of war facilities for which certificates of necessity were granted under the Internal Revenue Code.

It was further suggested that the aggregate unamortized cost of all GR-S, Butyl, and butadiene, and other raw material plants should be amortized over a further five years from the date of new legislation on a rate per pound produced basis, and that this practice would then provide a reserve fund for "renewals and improvements," derived from the selling price of the synthetic rubbers.

The selling price of synthetic rubber should include the following items only, it was stated: (1) the entire cost of manufacture and distribution without profit; (2) the "reserve for renewals and improvements" as defined above; (3) a proportionate amount of the selling and administrative expenses of the Washington Office of Rubber Reserve applicable to actual production and distribution of synthetic rubber apportioned on the basis of sound accounting practices; (4) the cost of research and development carried out by or for ORR for the purpose of cost reduction and only for such other purposes as come within the scope of the technical agreements of December, 1941, as may be modified from time to time.

Under research and development, the RMA stated that it recognized that so long as the plants remain under government control there may be practical difficulties in effecting complete transition from government sponsored research to private research, but that such an objective is desirable, and modification or cancellation of the technical agreements of December 19, 1941, should be sought, if not inconsistent with national security. After limiting the type of research to be carried out by ORR, as mentioned in item 4, above, the RMA added that, wherever practicable, development of special polymers and manufactured products and testing of products should be conducted separately by and at the expense of the military or other organizations concerned with the use of the products.

Figures given on the extent of the rubber industry's activity in privately financed fundamental research for the year 1946 showed 5,500 persons employed, an expenditure of $33,737,000, and a total investment in plant and equipment of $21,955,000. The total outlay for research and development since the inception of organized work in the field of synthetic rubber was given as $204,195,000.

With regard to the consumption of synthetic rubber, the industry feels that no sound security reason exists for maintaining the arbitrary ratios for synthetic rubber use now established by administrative policy. It believes that these ratios can be reduced in the future as the stockpile is augmented, without jeopardizing security. The NSRB should be given the authority to direct the agency administering the rubber regulations to revise the overall ratio of synthetic rubber used as security conditions permit or require.

The RMA stated further that the cur-

rent system of enforcing use through mandatory government regulation is foreign to our system of government and business. It has proved practical with respect to rubber during the war and immediate postwar years, but has dangerous implications in our American economic system. To make certain that such a system is not perpetuated, or serve as a precedent for other industries, its need should be reviewed again by Congress prior to March 31, 1949. This is the only proper forum to review such far-reaching government authority, particularly in the first session of the 81st Congress after the people have registered their opinion on this program and other government programs, it was added.

Under source and type of government administration, the RMA emphasized the desirability of the NSRB in collaboration with the industry as the top agency for laying down the broad policies of administering the rubber legislation which has its foundation in national security. The NSRB should formulate the appropriate industry advisory committees, and the industry suggests that it acquire the services of a small staff of persons with substantial rubber industry experience. Part-time as well as full-time personnel should be considered for such positions.

The industry recognizes the administrative difficulties involved in implementing yearly enabling legislation, but does not believe such consideration should be the determining factor in deciding the legislative period. The industry believes that the rubber regulations can be adequately administered by no more than ten persons, which total should not be considered difficult to provide for within the United States Department of Commerce budget and appropriations.

In conclusion, the RMA said that the industry believes that any law passed, as suggested, should be subject to review at each session of Congress until a final program on synthetic rubber can be established by the Congress. At such periodic reviews recommendations from the NSRB and from its Industry Advisory Committee should be called for.

Collyer's Statement

John L. Collyer, president, The B. F. Goodrich Co., in his statement to the Shafer Committee emphasized that the Goodrich company believes that free competitive enterprise is the way in which the long-range rubber problem of the United States and the world should be solved. If a problem of rubber for vital military security did not currently exist, Goodrich would strongly recommend to Congress that the United States government withdraw its participation from all phases of the rubber business, including stockpiling of rubber and the ownership and operation of any and all rubber-producing facilities.

The purpose of legislation concerned with rubber should be twofold, Mr. Collyer said. First, our greatest long-range military security in terms of rubber will come through establishment of a private American rubber industry just as private enterprise has achieved military security in terms of steel, aluminum, textiles, and many other strategic materials. Legislation should provide the greatest opportunity possible for American-made chemical rubbers to become established on a sound economic basis of production and use without the participation of government as an owner or operator of rubber producing facilities. Second, because the development of an economically sound American rubber industry of a size required to insure the military security of our country will take time, Goodrich believes the second purpose of legislation should be to provide for interim government participation in the American rubber field from the standpoints of production, distribution, and stand-by facilities, but only to the extent required by our military security needs. The new legislation should be limited to a two-year period, it was added.

The responsibility for our national security rubber program should be placed with the NSRB. Plants owned by the government or either owned or leased by private industry to include a total annual capacity of 600,000 long tons of GR-S and 85,000 long tons of Butyl were recommended as the actual total capacity in producing and standby units needed.

Legislation to define clearly two areas of usage of GR-S and Butyl rubbers was recommended, a military security area in which government should control required uses, and a voluntary use area in which rubber demand should be supplied by a free American rubber producing industry. Maximum production for required uses was suggested as 300,000 long tons of GR-S and 40,000 long tons of Butyl rubber a year, but changes in these maxima could be made at the discretion of the NSRB. In the area of required uses all manufacturers of rubber products should buy from the government the American rubber they need, in order that all manufacturers will purchase the amounts needed from the same source at the same price.

It is vital to a free competitive American rubber industry that the new legislation provide that upon the enactment of the law all existing agreements relating to patents and to the exchange of information with respect to American rubbers, to which the United States or any agency or officer of government acting on its behalf is a party, be terminated, Mr. Collyer averred.

It was suggested that a program for government financed research in the American rubber field is outside the scope of the legislation here proposed—that such research, if deemed necessary, be covered by separate legislation and be handled by the appropriate government agencies.

The way to determine the extent to which private capital will enter the general-purpose rubber field is to offer government owned plants for sale or for lease under conditions that will offer fair opportunity. Fair opportunity does not now exist because of legal and contractual barriers, it was pointed out.

It was recommended that the legislation provide that present government-owned American rubber producing facilities be continually offered for sale or lease, on fair terms and conditions prescribed from time to time by the NSRB in accordance with the purposes of the Act. The Act should contain a definite statement of policy favoring private purchase or lease and should provide that the acquisition and operation of any rubber producing facilities purchased or leased from the government will not be in violation of anti-trust laws. Finally, all disposal contracts should make adequate provision for the protection of rubber producing capacity in case of national emergency needs, and recapture, default, and surrender clauses should be included in such contracts, Mr. Collyer concluded.

Seiberling's Statement

J. P. Seiberling, president, Seiberling Rubber Co., warned the Shafer Committee that for "security reasons" the sale of government owned synthetic rubber plants to private interests should not be permitted until a national emergency rubber stockpile is built up.

"These facilities cost over a half a billion dollars," he said. "Their preservation and proper operation will be of vital importance to the future security of the United States. The responsibility belongs to the Congress—not to any appointed board of five or six men."

Mr. Seiberling recommended that the proposed legislation "prohibit the sale or lease of the plants to private interests for one year, or until such time as the national emergency rubber stockpile is substantially completed."

A long as the *mandatory use* of synthetic rubber is required, the private ownership of government copolymer plants should be prohibited, or such ownership should be participated in pro rate by all *compelled* to use synthetic rubber, it was added.

As not all users of synthetic rubber can afford such participation, it has been suggested that part of the copolymer plants be sold or leased to private owners, and part continue to be owned by government for supply to non-owning users. This suggestion, however, is impractical from a competitive standpoint unless the costs of production in the plants are substantially the same and the selling price of synthetic rubber to the user of government produced rubber is virtually at cost. Otherwise the private owner would have a very real and possibly decisive competitive advantage.

It is in vain, therefore, and futile to consider joining free-enterprise private ownership and mandatory use in the same legislation—as the two don't mix any better than oil and water, and any free enterpriser who contends to the contrary is just putting out a smoke screen to conceal his own schemes and competitive stratagems, Mr. Seiberling concluded.

Statement of R. S. Wilson

R. S. Wilson, vice president, Goodyear Tire & Rubber Co., first mentioned that he was a member of the Industry Advisory Committee to the Munitions Board which prepared the report read by Mr. Viles previously and that his company agreed to the five recommendations made in that report. He also pointed out that Goodyear was one of those who was referred to in the recommendation on "Ownership" which read as follows:

"Another part of the industry believes the exercise of this discretion relative to disposal of synthetic plants should be deferred until security pressures have been relieved and a program for complete disposal developed."

Mr. Wilson declared that his company believed that it will ultimately be possible for the government to withdraw entirely from the manufacture of synthetic rubber without endangering our national security, but that it was felt that the matter of ownership of the synthetic rubber plants should be dealt with at this time on a short-range rather than a long-range basis because of four presently existing conditions which affect the problem: (1) The interests of national security indicate that for the time being mandatory use of GR-S should be continued. (2) Our general-purpose synthetic rubber is inferior to natural rubber for most uses at this time. (3) A shortage exists in the world supply of natural rubber for 1948 and perhaps for 1949, due in part to the necessities of stockpiling. (4) The exigencies of the present world situation indicate the need of the utmost of flexibility in our synthetic rubber producing capacity. We cannot at

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this moment say when it might be important to expand our GR-S production rapidly or when it might be the part of wisdom to contract it.

Taking the position that very little would be sacrificed in the realm of free enterprise if we deal with the synthetic rubber problem a year at a time, it was stated that we have begun the gradual process of letting American synthetic rubber stand on its own feet. All non-transportation items have been removed from mandatory use, and if the recommendations of the Munitions Board Advisory Committee on pricing synthetic rubber are adopted, voluntary use will probably be still further stimulated. Sympathy was expressed with the desire of Congress and the government agencies dealing with rubber to have the long-term policy established as soon as possible. When we are dealing with a matter of national security that is so important that we are willing to compel our citizens by law to use certain quantities of a product that is inferior to an imported competitive product, and at times higher priced, we should move very circumspectly and be very sure of our grounds before we attempt to dispose of the problem permanently, Mr. Wilson said.

Other Statements

Portions of statements made by many other executives in the rubber and associated industries and in government agencies were reported in newspapers during the course of the hearings. Among those whose comments were recorded were: Dan M. Rugg, vice president, Koppers Co.; H. F. S. Safford, executive vice president, Ohio Rubber Co.; J. F. Schaefer, executive vice president, Cooper Tire & Rubber Co.; Ralph McCreary, vice president, McCreary Rubber Co.; H. W. Fisher, chemical products division, Standard Oil Co. of New Jersey; E. R. Bridgwater, rubber chemicals division, E. I. du Pont de Nemours & Co., Inc.; George Burger, independent tire consultant; Robert A. Winters, Rubber Heel & Sole Manufacturers Association; Gerald B. Hadlock, Office of Rubber Reserve; Under-Secretary of Commerce William C. Foster; representatives of the Justice Department, American Automobile Association, NSRB, and National Assn. of Independent Tire Dealers.

Mr. Rugg advised the Committee to establish a plant disposal policy and let the trading begin. He pointed out that the butadiene plants could not be sold unless consumption of GR-S was compulsory.

Mr. Safford said that compulsory consumption, now in effect, would have to continue "for a long time to come"—along with other existing government rubber controls.

Mr. Schaefer also recommended continuing controls, at least as long as compulsory consumption exists, so that smaller companies will not be hurt competitively.

Mr. McCreary, who said his firm was the "next to the smallest" tire manufacturer, urged disposal of the synthetic plants as soon as possible. He expressed the opinion that better synthetic rubber would result from free competition.

Mr. Fisher presented Standard Oil's proposed rubber program, which called for early disposal of synthetic plants to private industry, but said he thought it might be well to delay such a program for from six to 12 months. He declared that his company would be interested in leasing or buying one of the butadiene plants it operates for the government.

Mr. Bridgwater emphasized that the sole purpose of permanent rubber legislation should be to protect the national security. In order to promote *complete* independence of foreign rubber supplies, we should enact legislation that encourages private research and development and investment of private capital in new facilities for producing better synthetic rubber than we now have.

The point was made that mandatory use of synthetic rubber in tires and tubes will encourage private research and investment of new capital in facilities for making improved rubbers provided the law imposes no restraint, actual or potential, on competition between rubbers produced in existing facilities and rubbers produced in new facilities. The law must not require the manufacturer, or empower a government agency to require him, to use only synthetic rubber made in facilities built for the government during World War II or only certain kinds of synthetic rubber. Any such provision would deprive private industry of the incentive it needs to invest heavily in research and new facilities for making improved tire rubbers.

Mandatory use for purposes other than tires, tubes, and camelback is unnecessary. There is adequate incentive for development and production of improved rubbers for mechanical goods without any legislation.

In order to provide the maximum incentive for private research, the government owned synthetic rubber plants should be sold to private industry as quickly as possible, and the existing agreements for cross-licensing of patents and exchange of information should be terminated as soon as sufficient plants have been sold to supply the synthetic rubber demand created by the mandatory use law plus the voluntary demand. To have maximum effectiveness, research must be integrated with an operating plant. Freedom to engage in competitive research is essential to the national interest, but it must be coupled with freedom of choice on the part of individual manuturer to use whatever synthetic he finds will give his customers the most miles per dollar.

Mr. Burger urged a strong synthetic rubber industry to protect consumers against foreign rubber monopoly agreements. He also said that United States rubber manufacturers with interests in foreign natural rubber plantations should not be allowed to help formulate U. S. rubber policy.

Mr. Winters went on record for continuing government ownership and operation of the synthetic rubber plants "until sales can be made to persons or companies outside the rubber industry. Our member companies don't want to be put in the position of buying one of their major raw materials from one of their biggest competitors," he explained.

Under-Secretary Foster told the Committee that continued government controls are needed because supplies of natural rubber will not be adequate until the latter part of 1949. He said the government should retain enough of the synthetic rubber plants to meet security needs estimated at 600,000 long tons of GR-S and 80,000 long tons of Butyl rubber a year. He suggested that any plants sold or leased to private operators be disposed of on a future-delivery basis, with adequate safeguards to make sure that the companies will meet set production goals and sell their products in a fair and non-discriminatory manner.

He recommended that plant ownership be spread out over as many companies as possible to maintain competition and that provision be made in all sale or lease agreements for recapture of the plants whenever operations "are not continuing according to arrangement."

Mr. Foster emphasized the need of extending the authority to require a minimum use of at least 33 1/3% synthetic rubber in tires, tubes, and other rubber products and also recomended building a strategic stockpile and that government share with private industry in a "vigorous" research program on both natural and synthetic rubber.

Mr. Hadlock, of ORR, took the position that if the government turned over its synthetic rubber industry to private industry, the selling price of GR-S would be higher rather than lower. The present out-of-pocket cost of GR-S is between 14 and 14½¢ a pound, and a price of at least 18½¢ is necessary to cover depreciation and other charges, he said. The synthetic rubber plants have accumulated a deficit of $281,972,000, of which $247,491,000 is for depreciation and the remaining $34,481,000 is net operating deficit. Asked if the government has made a paper profit of $62,000,000 on its synthetic rubber industry since September, 1945, Mr. Hadlock said that figure was substantially correct, but does not include plant depreciation. A statement was presented for the GR-S plant at Baytown, Tex., operated by the General Tire & Rubber Co. for the ORR, covering the period of July 1 through September 30, 1947, which showed actual production cost—exclusive of amotization, etc.—to be 14.59¢ a pound.

Asked why the Canadian Government can sell GR-S for 16 to 16½¢ a pound, Mr. Hadlock replied that this price covered only production expenses and "little or no recapture on depreciation."

Chairman Arthur M. Hill of the NSRB presented a program for permanent legislation with which he said President Truman "is generally in accord." This program covered the following six points.

1. For at least two years a minimum of all new natural and GR-S rubber consumed in this country should be domestically produced GR-S. After that the proportion, not to exceed the present one-third, should be determined by the President.

2. Total annual operating and standby capacity should be maintained for at least 600,000 long tons of GRS.

3. For at least two years a minimum of all new rubber consumed should be domestically produced Butyl rubber, and after that the President can lower the mandatory requirement.

4. Mandatory usage should be limited to automotive-type tire casings and inner tubes and latex foam cushions.

5. A framework should be established for the transfer (with appropriate safeguards) of the government owned synthetic rubber facilities either by sale or lease to private industry. Facilities not thus transferred, but necessary for a capacity of 600,000 long tons a year should be maintained in standby condition by the government.

6. The government-industry patent pooling arrangement should be modified to the degree necessary for a "sound basis for disposal of government-owned synthetic rubber producing facilities as well as to provide incentvie for competitive research and development."

(An attorney for Office of Rubber Reserve testified that a proposal for modification of the patent pool by limiting its scope had been presented to the industry. He said the government had a stake in synthetic patents by reason of its investment in synthetic research and development.)

Lockwo-d on Rubber Hearings

In the December 15 *Rubber Report* by W. S. Lockwood and H. C. Bugbee, it was

stated that the testimony before the Shafer subcommittee had produced four significant facts, two disturbing tendencies and one comforting impression.

The four significant facts were listed as follows: (1) There is unmistakable proof that all responsible elements in industry and government are determined that a healthy synthetic rubber industry must be preserved as a vital cog in our national security. (2) There is a broad measure of agreement that, to obtain such security in rubber, continued government consumption controls are required until we have acquired the natural rubber stockpile goals set by the defense authorities. (3) There is complete support for the theory that *eventually* the synthetic rubber industry should be in private hands, standing on its own two feet as the rubber reclaiming industry always has, competing in a free enterprise system on a quality-for-price basis. (4) There is ample evidence that the Committee proposes to extend Public Law 24 substantially in its present form for a further period, probably through 1949.

The disturbing tendencies were considered to be: (1) The obvious national security need of a temporarily increased synthetic rubber production has caused repeated undercurrents of a desire to build and maintain a substantial GR-S stockpile, not for national security reasons, but for price protection. (2) The second disturbing tendency is the minority advocacy of compulsory use of synthetic rubber on a *permanent*, unlimited period of years basis.

The comforting impression was given as that fact that it is a privilege to live in a country where a man can sit down with the legislators who make his laws and debate with them what ought to be done. Each man who testifies tries to reconcile what he considers right for his company or his government agency with the national interest. The Congressmen holding these hearings are sincerely trying to weigh the evidence and come up with a policy strictly in the national interest. For a group of men unacquainted with the details of a great industry, they are doing a collectively able job of getting the facts, it was added.

Rubber Report predicted that in view of the probable use and ready availability of more than 250,000 tons of GR-S in 1948, the price of natural rubber will not in 1948 remain *for any substantial period* at more than 4¢ above or 2¢ under the sales price of GR-S. A year of relative price stability, with a floor provided by government stockpile purchases and a ceiling provided by the national security need of available GR-S to implement the natural stockpile program, was foreseen.

Commerce Department Report

E. G. Holt, in the Commerce Department's "Industry Report — Rubber" for November emphasized that the choice of the industry between natural, chemical, and reclaimed rubbers is more limited at the moment by the supplies immediately available, and their prices in relation to each other and to the prices of finished goods, than by the terms of the R-1 Order. Under prevailing circumstances there is every probability that less natural rubber will be used than is permitted under the Order, but more natural rubber will be used than would be the case if chemical rubbers were immediately available in ample supply.

The accumulation of additional strategic rubber stocks, except in case of imminent national emergency, seems incompatible with the temporary situation with respect to supplies, and logic would dictate that more settled conditions be awaited, it was said.

The world capacity for production of natural rubber, based on the planted areas theoretically capable of being tapped is approximately two million long tons annually. Reference was made to the 1947 new rubber consumption estimate of the Rubber Study Group Statistical Subcommittee of 1,650,000, of which 585,000 tons were chemical rubber. Present indications are that the estimates of total consumption and of synthetic rubber consumption will be exceeded and that world stocks of natural rubber will increase less than estimated. It is clear that the use of chemical rubber is at present an economic necessity. Only when natural rubber is in really ample supply will our national rubber policy need to rest its case on national security considerations alone, it was pointed out.

U. S.-U. K. Trade Agreement Suspended

The U. S. State Department on December 19 announced that at the request of the United Kingdom a section dealing with rubber of the general agreement on trade and tariffs that was recently negotiated at Geneva, Switzerland, was being suspended, pending renegotiation. The United Kingdom claims that it misunderstood the terms of the agreement.

Section C of Schedule XIX of the agreement makes provision for reductions in margins of preference on more than 800 items in British colonial areas and provides further that this concession may be made inoperative in the event that United States regulations require the consumption of more than 25% of general-purpose synthetic rubber out of the total consumption in this country of natural, reclaimed, and synthetic rubber.

"The provisions of the undertaking," the State Department said, "did not become clear until after the close of the Geneva conference. In view of the fact that there was not full accord on this undertaking the United States has agreed to its suspension, with the understanding that this arrangement does not involve relinquishing this concession on either side, but leaves the United States and the United Kingdom free to agree upon mutually satisfactory terms at a later date."

The British objections seem to have been mainly centered about the use of reclaimed rubber in arriving at the total rubber consumed in the United States and the amount of synthetic rubber in tons per year that we could use and still qualify for the reductions in margin of preferences in British colonial areas.

Year-End Industry Outlook

Among the year-end statements made by various rubber industry spokemen and executives, the RMA statement was probably the most comprehensive. The year-end review gave figures on production of tires and tubes and consumption of the three major types of rubbers in connection with the RMA statement that the rubber manufacturing industry in 1947 shattered all production estimates when it used a record 1,110,000 long tons of new rubber and poured out a three-billion-dollar flood of finished products.

This record, as measured against the previous peak-year of 1946, was as follows:

PRODUCTION OF TIRES AND TUBES
(In Units)

	1947	1946
Passenger-car tires	77,000,000	66,466,000
Truck and bus tires	17,500,000	15,832,000
Truck, bus and passenger tubes	80,000,000	77,251,000

RUBBER CONSUMPTION
(In Long Tons)

Natural rubber	556,000	277,597
Synthetic rubber	554,000	761,699
Total new rubber	1,110,000	1,039,296
Reclaimed rubber	285,000	275,410

The Association singled out as one of the most significant developments of the year the fact that voluntary consumption of American-made rubber had exceeded by a considerable margin the expectations of both government and industry officials. At the present time the industry is required to use American-made rubber to meet about one-third of its total requirements for new rubber. On a one-third—two-thirds basis the industry would have consumed roughly 370,000 tons of synthetic rubber had it conformed only to the now-existing minimum requirements. Actually, synthetic rubber consumption amounted to 50% of our total requirements. While it is true that minimum requirements did not drop to the 33 1/3% level until September, voluntary use has continued substantially in excess of the minimum through the past four months, it was said.

Major incalculable of a year ago appears to have been the fact that there was no way of computing 1947's staggering increase in driving. By every index—gasoline consumption, vehicle mileage and others—truck, bus, and passenger-car mileage has increased sharply since 1940. As a consequence, passenger-car tire production exceeded the best estimates of a year ago by roughly 25%.

Demand continues extremely high for all types of rubber products. Chief among items in which demand exceeds supply is conveyer belting, under heavy priority pressure both in the domestic picture and in Europe where it is urgently sought for rehabilitation of mines and other war-damaged industries.

Attention was called to the fact that neither the government nor the industry had sighted at the year's end a final solution to the national security aspects of the rubber problem. The industry enters 1948 still bound by the security restrictions written for the short term in March, 1947, in Public Law 24.

Rubber industry opinion on legislation to replace Public Law 24, which expires March 31, 1948, as recorded before the Shafer Committee in Washington, was reported earlier.

A year-end statement by Herbert E. Smith, president, United States Rubber Co., predicted that although production of most rubber products in 1948 will equal or exceed that of 1947, tire production will probably recede from the all-time high of just under 100 million casings in 1947 to a total of 83,000,000 casings in 1948. Output of rubber footwear will be further increased in 1948 although production in 1947 was substantially greater than prewar. The re-introduction of style and color has been a strong influence in footwear, and this is expected to continue. The active demand for rubber clothing and coated fabrics will continue, it was added.

Foam rubber, firmly established as cushioning in all transportation field, will be increasingly available through 1948 for domestic furniture and mattresses. New plant capacity and the increased supplies of natural rubber will help this rapidly growing industry, Mr. Smith added.

With the return of natural rubber achieved, the output of covered and uncovered rubber thread is expected to surpass prewar levels.

Industrial rubber products will be made in large volume. Production of golf balls,

bathing caps, and druggists' sundries has also been facilitated by the return of natural rubber, and this merchandise will be in ample supply although the demand will continue at a high level.

Mr. Smith estimated that in 1948 total natural and synthetic rubber consumption in the United States would be about 900,000 long tons, of which 61%, or 550,000 tons, would be natural.

P. W. Litchfield, chairman of the Goodyear board, in his year-end review also called attention to the fact that the rubber industry in 1947 for the second consecutive year contributed a record breaking production achievement to the nation's postwar recovery.

Mention was made of the growing mechanical goods capacity and expanded production in soles and heels, flooring, and other rubber products. Industrywise, the rubber manufacturers have done a marvelous reconversion and postwar production job in the past two years, Mr. Litchfield said. With wages up, materials and transportation costs rising, the industry has turned in a good performance in holding down the prices of its products.

John L. Collyer pointed out that in 1948, obviously, the work of cutting down the war-built backlog, in not only tires but in industrial products and sundries, will be progressively less of a factor in determining total demand, and in most articles the backlogs will have disappeared long before that year's end.

Significant developments during 1947 included a trend toward extra-low-pressure tires, mainly as original equipment, and the introduction of a tubeless, self-puncture-sealing tire. The rubber industry was able to play an important role in 1947 in one of postwar America's most important battles, that for food production, Mr. Collyer said. Farm vehicle tire sales set a new all time record, at more than $100,000,000, as American farmers continued to turn to the speed and economy of rubber-tired tractors and other implements in their intensified efforts to boost production to meet domestic and aid-to-Europe needs.

In the plastics industry, a field in which many manufacturers of rubber products have a considerable interest, George H. Clark, president, Society of the Plastics Industry, predicted a greater merchandising effort to consolidate its gains in the retail and industrial markets, a production high of 1,500 million pounds, plus continuing plant and facilities expansions totaling at least $175 million, as the chief objectives of that industry for 1948. He estimated that upon completion of the 1948 expansion of its production capacity the industry will be capable of producing at least twice as much as it produced in 1946, its previous peak year.

The Society estimates that about a half-billion pounds of plastics will be used throughout American homes in 1948. The automobile industry will consume another 50 million pounds, American refrigerator manufacturers will use at least 32 million pounds, radio manufacturers will use 12 million pounds, and in the aviation industry at least 15 million pounds will be used, it was said.

The Tire Price Suit

The RMA and the eight tire companies accused by the Department of Justice of conspiring to fix prices of tires and tubes asked the federal judge in New York, N. Y., in mid-December to have the proceedings changed from New York to Cleveland. It was stated that Cleveland was closer to the headquarters of most of the defendants. The Special U. S. assistant attorney immediately opposed the motion and told the presiding judge that Cleveland federal courts were very congested. The federal judge in the New York district then refused the change.

Labor News

Hearings before the Wage and Hour Division, United States Department of Labor, in Washington, on possible changes in the definitions of executive, administrative, and professional employes, produced a suggestion from Goodyear Tire & Rubber Co. that a salary in excess of $200 a month be recognized as presumption of an exempt status (elimination of requirement that payment for overtime be made). URWA local unions at the Goodyear and The B. F. Goodrich Co. plants in Akron, O., were reported as preparing to start a drive for a third round of wage increases. The president of the international URWA, L. S. Buckmaster, stated that a large number of local unions have petitioned the international union to call a meeting of the policy committee to make arrangements for a wage increase demand. The local URWA union at the Akron plant of the Firestone Tire & Rubber Co., however, finally voted to accept six paid holidays in place of a wage increase.

Wage-Hour Hearings

Walter E. de Bruin, of the Goodyear legal staff, the first witness at hearings called by the Wage and Hour Division, Department of Labor, to consider revision of the regulations which govern exemptions from the minimum-wage and overtime-pay provisions of the Fair Labor Standards Act of 1940, suggested that any change in the definitions of executive, administrative, and professional employes should recognize a salary in excess of $200 a month as presumption of an exempt status.

With such a presumption set up in the regulations, the burden of proof would be shifted to the employes. Employers claiming exempt status for certain employes now have to prove the exemption. Under the proposal the employe would have to prove non-exemption to claim overtime rights. Present regulations require a minimum salary of $30 a week for persons in an executive capacity and $200 a month for administrative and professional employes.

URWA Wage Increase Demand

A meeting of the policy committee of the international URWA is scheduled for the near future to formulate a demand for a third round of wage increases. Mr. Buckmaster stated that the pressure of continually mounting prices is causing increasing hardship among the families of the members of the union.

"We had hoped that the Congress would take positive action to solve the price problem. To date Congress has shown no disposition to do so," Mr. Buckmaster declared.

The union is collecting data on living costs, wages, and profits, and as soon as this study is completed, the policy committee will be assembled, it was said.

Meanwhile local unions at the Goodyear, Goodrich, and General Tire & Rubber Co. plants in Akron voted to ask for wage increases. The local Firestone union which had been asking for a "cost of living" wage increase finally voted on December 16 to accept six paid holidays in place of the wage increase. Thus all of the Big Four companies have recently granted six paid holidays.

Latex Restrictions Eased

Removal of all restrictions on manufacturing uses of natural rubber latex, except in certain sizes of seat cushions, was announced December 3 by the Office of Materials Distribution, United States Department of Commerce. Amendment of Rubber Order R-1 to permit unlimited use of natural latex in all latex foam products other than seat cushions will eliminate many technical manufacturing difficulties encountered in blending natural and synthetic latex, OMD said. It is expected also that the relaxation will encourage imports of natural latex into this counry.

After consultation with industry committees, OMD is retaining specifications which restrict the proportion of natural latex to be used in the manufacture of foam seat cushions of 2½ inches average thickness or less. The largest volume of natural latex used by the foam industry goes into this product, and the problem of blending natural and synthetic latex for the purpose has been solved successfully, OMD explained.

RMA Directors Reelected

Reelection of five members to the board of directors of The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y., was announced last month by the Association. The members reelected for terms expiring in 1950 were: H. S. Marlor, vice president, United States Rubber Co.; C. G. Garretson, president, Electric Hose & Rubber Co.; J. P. Seiberling, president, Seiberling Rubber Co.; Harry E. Smith, vice president, Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc.; and J. Newton Smith, president, Boston Woven Hose & Rubber Co. The board of directors consists of 15 members, elected for three-year terms in groups of five.

A. L. Viles, president, and other officers of the Association were also reelected at the annual meeting held in New York.

Exhibitors Advisory Council, Inc., 120 Greenwich St., New York 6, N. Y., last month held its annual election of officers. Among those now serving on the board of directors are: F. J. Maple, advertising manager, John A. Roebling's Sons Co., Trenton, N. J.; and W. H. Uffelman, manager, general exhibits division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. The Council is a non-profit, fact-finding organization of manufacturers interested in the improvement of shows and expositions; it cooperates with exhibit committees of the Association of National Advertisers and the National Industrial Advertisers Association.

War Assets Administration, Washington, D. C., in its recent listings of surplus property for sale included chemicals, adhesive cement, Lucite sheet, nylon molding powder, Bakelite sheets, polystyrene sheets, rubber compound, plastic tubing, gaskets, cable, hose, storage batteries.

EASTERN AND SOUTHERN

Moody, Others Advanced by U. S. Rubber

The appointment of Curtis L. Moody as factory manager of United States Rubber Co.'s Detroit, Mich., plant was announced last month by the company's tire division. Besides his new duties Mr. Moody will continue also as assistant production manager of the tire division.

Harold Weigold, assistant factory manager of the company's plant in Eau Claire, Wis., has been appointed assistant factory manager of the Detroit plant.

Clayton L. Remy and Robert E. Lundgren have been transferred from Detroit to Eau Claire. Mr. Remy will be production superintendent of the Eau Claire plant, and Mr. Lundgren, plant engineer.

Forbes Williams was named manager of product control, tire division, with headquarters in Detroit.

Changes in the Detroit plant organization were the appointment of Frank L. Swanson as plant engineer; George F. Wikle, process engineer; C. A. Neville, manager, product control; and Daniel E. Durst, general superintendent of tire production.

Glenn T. Welton has been appointed sales manager of the shoe hardware division of U. S. Rubber to succeed Alden G. Stevens, resigned. Mr. Welton's responsibilities will include sales of Kwik slide fasteners, buckles and aluminum lasts. His headquarters will be in the shoe hardware division plant at Waterbury, Conn. Mr. Welton has had more than 11 years' selling experience with the rubber company, which he had joined early in 1936 as a clothing salesman. In 1938 he was transferred to the coated fabrics division, where he has had broad experience in selling manufacturers and jobbers.

John S. Krauss, a pioneer developer of the V-belt industry, has retired as manager of the L. H. Gilmer division of U. S. Rubber, Philadelphia, after 35 years of service. He will be succeeded by Lawrence K. Youse, former technical superintendent of the V-belt plant and recently assistant manager. Mr. Krauss started his career in 1912 as an assistant to L. H. Gilmer, who was in the process of expanding production of belts which he had invented while working as a printer for a Philadelphia newspaper. Mr. Krauss helped develop the early automobile fan belt and other special belts for machinery. At a luncheon in his honor, Gilmer employes presented Mr. Krauss with a television set as a token of their good wishes. Although he will no longer take an active part in management, it was announced that he will be available for consultation.

New Developments Announced

Savings by federal, state, and municipal governments estimated at more than a hundred million dollars are now possible by a modern method of sealing concrete highways and airfield runways against the ravages of weather. A rubber compound, called Sealz, developed by U. S. Rubber, can be used to seal the joints between the concrete slabs. The compound stretches in winter and compresses in summer without breaking and without separating from the concrete, thereby eliminating water seepage and helping to prevent heaving and breaking of pavement. Annuel refilling of pavement joints is eliminated, and surface life is increased many years, according to

Sealz-Melter, U. S. Rubber's Automatic Melting Unit for Sealz, the Joint Sealing Compound for Concrete Pavement

Samuel P. Tauber, the company's sales agent for the material.

The company's engineers have also developed and tested improved equipment for melting and pouring Sealz. The Sealz-Melter is compact, easy and inexpensive to operate, and relatively low in cost, according to Mr. Tauber. It melts the compound in less than an hour and controls the temperature so that the rubber is not damaged from overheating. The melter, of the double-boiler type, uses hot oil as the heating medium. It operates on a continuous cycle and handles three 50-pound bags of Sealz. The melted Sealz is withdrawn through a fully insulated valve seated in the oil bath chamber. A hand pouring pot has also been developed which pours a neat joint even when operated by an inexperienced man.

A 50¢ golf ball to help economy-minded golfers combat inflation will soon be rolling off U. S. Rubber's production lines. Although the ball has an exceptionally tough cover to withstand abuse, it will not fly so far as the top-grade U. S. Royal, which retails for about 95¢, or the well-known U. S. Fairway, generally retailed at 70¢. The new ball went on sale in the South and other resort areas on January 1 under the name of U. S. Nobby; it will be available throughout the country in the spring. According to George McCarthy, company manager of golf ball sales, in addition to its economy the new ball is also good for practice play and for beginners.

U. S. Rubber has announced the development of Rug-Sealz, a new, self-curing liquid, white rubber adhesive described as a "first aid for carpets." According to John P. Coe, vice president and general manager of the company's Naugatuck Chemical Division, the new material speeds and improves techniques of joining and edgebinding carpets and repairing damaged portions. When painted over binding tape or sewing, the adhesive forms a tough, permanent seam invisible from the top side of the carpet. Rug-Sealz also prevents fraying of raw edges, when used either alone or with tape, and is said to be strong enough to butt-join sections of carpet padding without reinforcement. Areas of dry rot can be repaired by coating these areas on the underside of the carpet with Rug-Sealz. The material also antiskids carpets when it is painted over the entire backing. The adhesive is odorless, resistant to copper in wool dyes used in carpets, and has good aging qualities. It is thin enough, moreover, to penetrate well and cures without heat in less than an hour, Mr. Coe further declared. One pint of Rug-Sealz, applied with paint brush or dauber, covers an area of carpet backing nine feet square. The adhesive is being supplied to about 60 carpet and rug distributers and accessory houses throughout the country.

Raybestos-Manhattan Inc., Manhattan Rubber Division, Passaic, N. J., has appointed P. L. Edwards assistant manager of its central district office in Pittsburgh, Pa. Mr. Edwards, formerly manager of the products division of Manhattan's western district office, started with the company 29 years ago as a clerk in the Chicago office.

Fred S. Conover has rejoined Manhattan in a new position concerned with technical development and compounding work. A native of New Jersey, Mr. Conover received his B.S. degree from Colgate University in 1922 and joined the former Dexter Rubber Co. In 1923 he went with Republic Rubber Co. and in 1925 became associated with New Jersey Zinc Co. He was with Manhattan Rubber from 1930 to 1934 and then worked with Rubatex Products, Inc., for about one year before joining Naugatuck Chemical Division, United States Rubber Co.

Drake America Corp., 15 Broad St., New York 5, N. Y., has purchased an 11-story building at 18 E. 50th St., New York, which it will occupy as its headquarters as soon as possible. The structure, on a plot 56 by 100 feet, contains approximately 60,000 square feet of floor space. Drake America, an international trading company, controls a number of domestic and foreign concerns and is expanding its world-wide operations. Among its imported and domestic products are those of its Rogers International Division, Armstrong Rubber Co., and Indian Motorcycle Co.

Then on December 10, Colonel Artamonoff announced the appointment of Arthur A. Zeitlin as regional manager for Africa and the Middle East, and P. G. Leslie as regional manager for the Far East. Mr. Zeitlin, a consulting engineer with 14 years' background in the Middle East, formerly was agent and distributer for Rogers International in that area. Mr. Leslie, formerly a commercial agent of Amsterdam, Holland, served during the war with the American and British governments and has been in the Americas since 1940.

Colonel Artamonoff said the regional managers would develop export outlets for Drake America and its export subsidiaries, Rogers International, Armstrong Rubber, and Indian Motocycle Export Corp., and advise agents on the establishment of maintenance and service departments for vehicles and machinery these companies send abroad. They also will establish sources of the goods and commodities of their region for import to this hemisphere through Drake America channels. Both men will leave shortly on extended tours of the areas they will cover.

Introduces New Heat Unit

Bethlehem Foundry & Machine Co., Bethlehem, Pa., on December 9 exhibited its new Beth-Tec heat unit to members of the technical and trade press and daily papers. J. Howard Van Sciver, president of Bethlehem Foundry, also presented one of these units to Lehigh University's President Martin D. Whitaker. This unit, installed in the department of chemical engineering at the university, has been undergoing tests and will be a contribution to the work being done there on chemical processing at high temperatures.

Production engineers responsible for supplying heat for processing have long been seeking a way to supply heat at temperature levels somewhere between that of direct fire and steam. Workers in the research department of E. I. du Pont de Nemours & Co., Inc., developed a heat transfer medium consisting of a mixture of inorganic salts which has proved to be the only commercially feasible material to transfer heat in the broad range between flame and steam temperatures. Although this heat transfer medium has been used in some large plants and in some special applications, it was the engineers of Bethlehem Foundry who developed and perfected the Beth-Tec unit with the cooperation of du Pont research workers.

With this new heat transfer salt and the new unit, industrial process heat with the following advantages is obtained: (1.) There is no appreciable vapor pressure in the system. (2.) The degree of heat is easily controlled. (3.) The coefficient of heat transfer is good; the low temperature difference required is an advantage in the design of equipment to operate at high temperature and high pressure. (4.) The possibility of toxic fumes or vapors is remote.

The Beth-Tec unit consists of a vertical water tube of boiler which should give the minimum of difficulty due to accumulation of scale and dirt on any part of the heat transfer surface. Initial units are to be fabricated from carbon steel and should be suitable for working temperatures up to 850° F.

Koppers Co., Inc., Pittsburgh, Pa., recently acquired all the stock of the Manufacturers Chemical Corp. and its sales subsidiary, the Chemaco Corp., both of Berkeley Heights, N. J. Dan M. Rugg, vice president and general manager of Koppers chemical division, which will operate the newly acquired plant, and Henry Harding, Manufacturers president, said in a joint statement that the purchase was made by issuing shares of Koppers common stock to the owners of the purchased companies in exchange for their previous holdings. Manufacturers is engaged in processing compounds made of polystyrene, cellulose acetate, and ethyl cellulose, which Chemaco sells. All personnel of the purchased companies will join the Koppers organization under present plans, Mr. Rugg added. Mr. Harding will become assistant sales manager of the Koppers chemical division; Karl M. Joehnck, vice president and production manager, will become manager of the Manufacturers' plant; and Walter J. A. Conner, vice president and sales manager, will become assistant eastern district sales manager for Koppers in the chemical division.

O'Sullivan Rubber Corp., Winchester, Va., has appointed V. R. Childress manager of industrial plastics sales. Formerly with B. F. Goodrich Chemical Co. in the Geon polyvinyl materials sales department, Mr. Childress will devote his efforts to the industrial applications of O'Sullivan's Sulvyne materials. His technical background includes a B.S. in chemistry from the Alabama Polytechnic Institute and eight years with Goodrich, where his duties varied from the research department to factory service development work.

V. R. Childress

Witco Chemical Co., 295 Madison Ave., New York 17, N. Y., recently began construction of an asphalt processing refinery in Perth Amboy, N. J., which is expected to be in operation by mid-1948. The new plant is being built on a 30-acre plot, and the plant site has already been graded, a railroad siding constructed, and roads, retaining walls, and water and sewage lines have been installed. Constructed under the direction of the company's engineering department, the plant will specialize in the production of asphaltic materials to meet exact specifications, including compounding, waterproofing, mastics, fillers, mineral rubbers, battery boxes and sealers, and other special uses as well as standard asphaltic materials for roofing, paving, etc. For more than 35 years western consumers of asphaltic products have been supplied by Witco s Pioneer Asphalt plants at Lawrenceville and Chicago, Ill. The new plant will take care of eastern requirements for the company's asphalt products.

Warwick Chemical Foundation, formed for the purpose of setting up memorials to the memory of three members of Warwick Co., 580 Fifth Ave., New York 19, N. Y., who were killed in World War II, recently announced endowments to three colleges. Awards of $3,000 each were made to Lowell Textile Institute, Clemson College, and Philadelphia Textile Institute. The endowment funds and their incomes are to be used as the governing boards of the colleges shall designate, primarily for scholarships to encourage education and research in chemistry, to enable worthy students to pursue graduate studies in chemistry, and otherwise to promote chemical education. Announcement of the awards was made by Ernest Nathan, president of the chemical company and of the Foundation.

Personnel Changes at Thermoid

In line with its expanded sales and manufacturing program Thermoid Co., Trenton, N. J., last month announced the following personnel changes.

Jack Brand, formerly assistant sales manager for the automotive replacement division at Trenton, will handle industrial sales for the State of Colorado, with headquarters at Denver.

J. J. Chamberlain, formerly associated with Pioneer Rubber Mills of California and the rubber division of Paramount Mfg. Co., will handle industrial sales in the State of Washington and the northern half of Oregon, with headquarters in Seattle.

E. J. Dunlap has been transferred from Trenton, where he headed industrial sales promotion, to San Francisco, Calif., where he will have charge of industrial sales for the northern half of California and southern Oregon.

A. Fred Matheis, in industrial sales at Trenton headquarters for 20 years, assumes the duties of industrial sales promotion manager.

H. William Overman, manager, industrial friction materials division, has transferred his headquarters to the Thermoid office at 422 Boulevard Bldg., Detroit, Mich., where he will continue to direct industrial friction material sales.

Jack Wright, who will headquarter at Salt Lake City, Utah, has been assigned industrial and oil field sales in Utah, Idaho, Wyoming, Montana, and Western Canada.

According to Thermoid, its new manufacturing unit at Nephi, Utah, is at present undergoing pilot runs. Full production is anticipated early in 1948.

Givaudan-Delawanna, Inc., 330 W. 42nd St., New York 18, N. Y., has announced the formation of Sindar Corp., a separate company formed to take over the activities of Givaudan's industrial products division. Sindar will therefore be devoted to the manufacture, promotion, and sales of industrial aromatics, antiseptics, germicides, mildew-preventives, preservatives, stabilizers, and other products for the textile, rubber, paint, paper, plastics, and printing industries. Sindar is located at the same address as the parent company, has branch offices in Chicago, Los Angeles, Philadelphia, Cincinnati, Detroit, Seattle, and Boston, and is represented in Canada by Stuart Bros., Ltd., of Montreal and Toronto. The new company will combine the experience of the Givaudan organization in aromatics and related fields with the advantages of concentrated attention to the promotion of its products and the development of new commodities.

General Aniline & Film Corp., 230 Park Ave., New York 17, N. Y., has made the following changes and promotions at its central research laboratory, Easton, Pa. Donald L. Fuller, Carl Barnes, and Fritz Max have been promoted to the office of associate directors of the research laboratory. W. W. Williams has been transferred from the Rensselaer dyestuff plant to the central research laboratory as the azo dye section leader; while John Copenhaver and Clyde McKinley have been advanced to section leaders in the new products department of the laboratory. New group leaders in the physics department are J. M. Lambert, G. T. Gross, and H. Hemmendinger; in physical chemistry, C. H. Benbrook; and in the analytical section under L. T.

Hallett, C. W. Gould and S. Siggia were made group leaders. The photography and polymers division under Dr. Barnes has as new group leaders in W. A. Schmidt's photography section, J. A. Sprung and V. Tulagin. W. O. Ney is a new group leader in the polymers group. The central research laboratory is under the direction of A. L. Fox, with C. R. Wagner as General Aniline vice president in charge of all research and development.

J. M. Huber Corp., 347 Madison Ave., New York, N. Y., is distributing more than $400,000 among its employes under a new profit-sharing and bonus program put into effect during 1947, it was announced by Hans W. Huber, company president. Each Huber employe in 17 states and 21 cities in which the company maintains manufacturing, distribution, or sales divisions will participate in this plan if he has been with the company six months or longer, the announcement stated. The company's operations have continued to expand during 1947, Mr. Huber said. Carbon black production in the company's Borger, Tex., plant is at full capacity. Seventy-six new oil and gas wells have been drilled during the year, and the company now has more than 300 producing wells in Kansas and Texas.

On his return after a six-week survey of Europe's rubber center, C. A. Carlton, technical director of Huber's rubber and new products division, reported that the increasing trend to motorized transportation throughout western Europe has resulted in a high level of rubber goods production exceeding prewar standards. Although rubber plants are operating at maximum production levels, the supply continues to fall far short of demand. Swedish manufacturers have reduced production because of a power shortage arising from the longest drought on record, Mr. Carlton said. Rubber production in Milan and Turin, in Italy, is recovering rapidly. In some cases government agencies are acting as purchasing and distributing agents for many raw materials used in the manufacture of rubber transportation items such as tires. In discussing the difficulties of expansion by European rubber manufacturers, Mr. Carlton cited the shortage of building materials, the inability to obtain new equipment, and the shortages of carbon black and clays. As for the general outlook, the Huber executive related that most European management and production men believe it will take one year or two years to catch up with tire needs and several years longer to meet the demand for mechanical rubber goods.

Electric Heat for Plastics

(Continued from page 508)

ing applications in the processing of equipment used in the plastics industry. The speaker reviewed heat treating operations using controlled atmosphere furnaces, Ajax-Hultgren salt baths, and high-frequency heating. Slides were shown illustrating the G-E atmosphere furnaces, electrode-type salt baths for descaling use, and caustic nitrate baths for cleaning rubber and glass molds. After the talk the General Electric sound-slide film, "Infra-Red Lamps for Better Production," was shown.

MIDWEST

Reichhold Expanding

At the annual management-managers' meeting of Reichhold Chemicals, Inc., Detroit, Mich., held December 1 at the Detroit Athletic Club, Henry H. Reichhold, chairman of the board, announced that the corporation will spend approximately $10,000,000 for expanding and enlarging the company's production facilities at plants in Detroit, Elizabeth, N. J., Brooklyn, N. Y., South San Francisco, Calif., Tuscaloosa, Ala., Seattle, Wash.; Liverpool, England; Paris, France; Sydney, Australia; Rio de Janeiro, Brazil; Milan, Italy; and Zurich, Switzerland; and for building additional plants in the United States to increase the available amounts of certain scarce chemicals. In recent years these raw material scarcities have curtailed the company's production of synthetic resins, chemical color pigments, phenolic plastics, and industrial chemicals, and it is believed that the new plants will, to a major degree, eliminate these retarding influences.

Last year, and in addition to expanding the manufacturing facilities of all its factories, the company opened new plants in Seattle to make phenolic adhesive resins, in Tuscaloosa to make chemical color pigments, in Elizabeth to make maleic anhydride, and in Zurich and Milan to process synthetic resins. At present a synthetic resin plant is in process and construction in Rio de Janeiro, and another is to be started soon in Mexico City.

Mr. Reichhold also announced that Fred Grosius, treasurer of the company, and T. K. Haven, vice president in charge of finance, had been elected to membership on the corporation's directorate. H. W. Mason, Jr., and E. A. Terray had been elected to vice presidencies, the former in charge of purchases and the latter in charge of exports.

Changes at Monsanto

Monsanto Chemical Co., St. Louis, Mo., because of unsatisfactory market conditions, on December 9 postponed the offering, announced last month, of 250,000 shares of Series B preferred stock, which was to have raised the sum of $25,000,000 to be used for general corporate purposes of the company.

The appointment of Richard O. Zerbe as director of the newly created development department at the Monsanto plant at Nitro, W. Va., was announced December 18 by R. L. Sibley, general manager, rubber service department. Mr. Zerbe had been employed at the Nitro plant in 1936 as an assistant research chemist, but was transferred to the plant's patent department a year later and in 1940 was appointed patent attorney. A native of Niles, Mich., and a graduate of the University of Michigan, where he received an M.S. degree in 1936, Mr. Zerbe is registered to practice patent law before the United States Patent Office. He has served three years as a councilman of the City of Nitro and is the chairman-elect of the Charleston Section of the American Chemical Society.

James P. Mahoney has been transferred from the Merrimac Division at Everett, Mass., to the organic division sales office at Chicago, Ill., where he will be in charge of Merrimac sales and sales development, replacing Ralph E. Nelson, resigned. Mr. Mahoney has been with Monsanto since 1940. During the war he served as a lieutenant colonel in the Ninth Air Force in the European theater and returned to Monsanto in June, 1946. He is a graduate of the University of Illinois, Class of 1940, and is a native of St. Louis.

Roger C. Sonnemann has been appointed industrial relations director for Monsanto's plant at Everett, Mass., it was announced December 10 by Plant Manager J. A. Wilson. Mr. Sonnemann, a graduate of the University of Illinois, was first employed by the company at its John F. Queeny plant in St. Louis in 1940, but was transferred to Everett in 1942 as assistant superintendent of the phthalic anhydride department. He was appointed superintendent of the sulphuric acid department in Everett in 1946.

Edwin L. Hobson has been made sales manager of thermoplastic molding materials, according to James R. Turnbull, general manager of sales of Monsanto's plastics division at Springfield, Mass. Mr. Hobson, assistant branch manager for the company's New York plastics office, replaces Arnold C. Martinelli, who resigned to become general manager of Rogers Plastics, Inc., North Wilbraham, Mass.

Mr. Hobson is replaced at New York by James P. Skehan, sales manager for sheet plastics. The sheet department will be combined with the packaging materials department under Richard C. Evans. Assisting Mr. Evans as assistant sales managers will be James Brunner, in charge of packaging materials sales, and Oscar E. Hollemans, in charge of sheet sales.

Mr. Hobson, a native of Richmond, Va., received a B.S. in chemical engineering from Massachusetts Institute of Technology in 1936. A former sales engineer for Bakelite Corp., he was a lieutenant colonel in the Quartermaster Corps from July, 1941, to June, 1946. He joined Monsanto on completion of his tour of duty.

Mr. Skehan, who was born in West Springfield, Mass., came to Monsanto as a laboratory assistant in 1929, was transferred to the sales department in 1938, and became assistant sales manager of the sheet department in 1945 and sales manager in May, 1946.

Tom K. Smith, Jr., has been made assistant branch manager of the phosphate division and now is in charge of the Cincinnati branch of the division's Detroit office. The territory served by the Cincinnati office embraces parts of Kentucky, Ohio, West Virginia, and Indiana. A graduate of Williams College in June, 1939, Mr. Smith has been with Monsanto since November of that year. During the war (from 1941 to 1946) he served with the Army Ordnance.

Monsanto on December 12 awarded leaves of absence to attend the advanced management program at the Harvard University Graduate School of Business Administration to Charles H. Sommer, Jr., and Louis F. Loutrel, Jr. The latter, director of the Merrimac Division development department at Everett, Mass., and Mr. Sommer, assistant manager of the organic chemicals division sales department in charge of plasticizers, resins, and intermediates at St. Louis, will enroll in the 13-week program for the spring term beginning February 25, 1948 .

George O. Linberg, sales manager of Monsanto's textile chemicals department, of the Northern New England Section, Everett, Mass., was reelected chairman of the American Association of Textile Chem-

ists & Colorists, at the recent meeting of the group in Boston. Jay Harris, of Monsanto's central research laboratories, at Dayton, O., was the principal speaker of the meeting. His subject was "Builders in Detergents."

Midland Rubber Co., Cedar Rapids, Iowa, according to Sales Manager T. Van Etten has appointed Merwin F. Read its Detroit representative for automotive sponge rubber products, with offices at 512 Donovan Bldg., Detroit, Mich. Midland manufactures mechanical and sponge rubber products for both the industrial and the automotive trade as well as a complete line of sponge play balls for the toy trade.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill., has appointed Columbus Basile superintendent of its Caldwell plant at 2410 W. 18th St., Chicago, which manufactures screw conveyers, Bulk-Flo conveyers, coal stokers, car spotters, ice-slingers, and many other items of materials handling and power transmission equipment. Mr. Basile entered the employ of the Link-Belt Pershing Rd. Chicago plant in 1928. He did general shop work until 1938, when he became a division manager for Sears Roebuck & Co. He returned in 1941 to become foreman of the machine shop of Link-Belt Ordnance Co. For the last three years he has been in charge of time study and methods at the Link-Belt plant in Philadelphia.

Leonard C. Heinlein has been named to the newly created position of assistant superintendent at the company's ball and roller bearing division plant in Indianapolis. All production and its attending problems are included in the functional duties of this new office. Mr. Heinlein joined Link-Belt at this plant in 1926, immediately following graduation from Purdue University, School of Mechanical Engineering. This plant was at that time the headquarters for the manufacture of Link-Belt silent and roller chain drives. Mr. Heinlein spent the first several months in various shop departments to gain shop experience. He then successively served in the experimental department; shop maintenance department; and on research and development work. He worked in the plant laboratory from 1933 to 1935 and was then transferred to the engineering department to work on silent and roller chain drive applications. He started in the engineering department of the anti-friction bearing division in 1939 and has since then been engaged on the design and application of these bearings.

NEW ENGLAND

Charles E. Reynolds has joined the Odell Co., Watertown, Mass., manufacturer of industrial pressure-sensitive adhesive and mastic tapes. The company plans a program of expansion and will introduce many new products under Mr. Reynolds' direction. Mr. Reynolds has had many years of experience in the proofing and footwear industries. From 1923 to 1929 he was head chemist and assistant superintendent for Vulcan Proofing Co. In 1929 he joined Cambridge Rubber Co. as superintendent of the proofing department, became chief chemist in 1938, was promoted to technical superintendent in 1940, and became technical director of all plant operations in 1942. Mr. Reynolds is a member of the Division of Rubber Chemistry, A.C.S., was chairman during 1947 of the Boston Rubber Group, and is a member of the advisory board of India RUBBER WORLD.

C. E. Reynolds

Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass., has completed installation of printing presses in each of its carbon black plants on which individually marked or coded bags are printed on the spot for rubber manufacturers using the company's blacks. Ten of these large, electrically driven presses have been put into operation, and two additional presses are in the process of being set up. Thereafter, all Cabot and General Atlas black shipped in bags will be clearly identified by printed markings which will include brand names and grades, net weight, and the individual code numbers of the company buying the black. Bags for each order will be printed separately, not only for each customer, but also for each shipment, regardless of size. This practice is made possible by the flexibility of the high-speed presses which have a capacity of up to 2,400 bags an hour and require less than a half-hour to change over printing plates. The presses are housed in new, special printing buildings of their own, placed outside the packing houses, and precautions are taken to prevent infiltration of carbon black particles into the pressroom. The presses are so elastic in their capacity that they can print any bag now in use by the industry, whether foreign or domestic. Some export bags have already been printed and shipped, and the presses are printing bags in French and Spanish, with other languages to be added as required.

Boston Woven Hose & Rubber Co., Cambridge, Mass., its origin and development, was the subject of a story in the December 15 issue of the *Royle Forum.* Starting with a brief history of fire hose, the story traces the growth of the company from its founding in 1878 to manufacture fire hose, its gradual diversification of products, its development of new processes, including the Rotocure process of continuous vulcanization, and the company's present prospects and plans for expansion.

Sponge Rubber Products Co., Shelton, Conn., has named Rosenfeld-Kent Co., Inc., exclusive distributer in the Metropolitan Area for the Spongex rug cushion and Spongex Non-Skid.

OHIO

Goodrich Appointments

Philip H. Zuiderhoek has been named factory manager of the Tuscaloosa, Ala., plant of The B. F. Goodrich Co., Akron, succeeding Joseph C. Herbert, assigned other duties. Mr. Zuiderhoek has been with the company since 1929, when he started as an employe in the Akron factory. He was appointed to his first supervisory position in 1936 at the company's Oaks plant in Phoenixville, Pa., and had been production superintendent at the Miami plants since 1945.

Several appointments in the recently created plastic materials sales division of the Goodrich company have been announced by L. H. Chenoweth, division general manager. E. L. Byan is now manager of sales for coated fabric, calendered sheet, coated wire products, and Playponds; William M. Gaston, manager of distributers' sales; R. L. Hill, manager of sales for extruded and molded products; and N. P. Singleton, manager of sales for cast and calendered film, coated paper, and packaging material.

Mr. Byan, a graduate of the Armour Institute of Technology, has been with the company since 1934. Mr. Gaston, a graduate of Baker University joined Goodrich in 1926, was credit manager in its St. Louis district when he entered naval service in 1942; he returned in 1945 as a lieutenant commander. Mr. Hill with the company since 1945, is a graduate of Kent State University. Mr. Singleton, a graduate of the New Bedford Textile School, has been with the rubber company since 1939.

Howard E. Fritz, Goodrich vice president in charge of research, has been elected to the Alumni Advisory Board of Ohio State University. Dr. Fritz, a graduate of Ohio State, was a faculty member there before joining Goodrich.

Chester A. Capron, a member of the Goodrich processing division, recently received a 50-year service emblem from John L. Collyer, company president.

A new heavy-duty industrial apron made of clear Koroseal film has been announced by Goodrich. The apron is said to be resistant to acids, greases, caustics, gasoline, animal fats and blood, vegetable fats, solvents and soaps. It will have wide usage in factories, dairies, canneries, hospitals, hotels, restaurants, institutions, cheese manufacturing plants, laboratories, and other places. The aprons have tape, hem, and grommet construction and are made in two sizes: one 29 by 35 inches and weighing 14 ounces, and the other, 35 by 45 inches and weighing 1½ pounds. All points of stress are reinforced with a cloth insert covered with Koroseal film.

Many drivers are buying new tires in pairs and are having their old tires recapped with a "mud-and-snow tread de-

sign for winter driving, Goodrich reports. Reasons for this trend are the greatly stimulated interest in winter sports and the fact that the modern extra-traction tread of button-bar design is engineered to provide better pulling power under rugged conditions with only a slight sacrifice in riding comfort.

The Keller "Super-Chief," a newcomer to the small car field, recently displayed in the lobby of the Hotel Pennsylvania, New York, N. Y., is "cradled in rubber." Each of the car's four wheels is independently suspended on a new version of the Goodrich Torsilastic spring, and the "cradling" effect was apparent even to the casual observer whenever a car door was opened. This is the first production-line use of the Torsilastic spring in passenger cars. In contrast to the huge units that have become standard on Twin Coach buses and some trailers, the units on this 92-inch wheelbase car have the main member, the rubber-and-steel cylinder, placed at right angles to the car's frame instead of parallel to it.

Eagle-Picher Co., Cincinnati, has appointed G. A. Cowan sales manager of the new Celatom products department, according to T. C. Carter, vice president in charge of insulation and dictomaceous earth products. The new department was created to distribute Celatom, a diatomaceous product which has wide industrial use as a filteraid high temperature insulation and as a filler for paints, plastics, polishes, and paper. Eagle-Picher entered this field a year ago with the acquisition of a large diatomaceous earth deposit in Clark, Nev.

Except for 2½ years as a captain in the Army Air Corps, Mr. Cowan has been with Eagle-Picher since 1933. Previously he had worked two years as field engineer for the American Laundry Co. He started with the lead and zinc mining and fabricating company as a home and industrial insulation salesman covering the Midwest. In 1936 he was promoted to divisional sales manager responsible for all Eagle-Picher products west of the Mississippi. He handled white lead paint, metallic products, pigments and insulation materials. Since returning to the company after the war, he has been stationed in Cleveland, specializing in industrial insulation. Mr. Cowan was graduated from the University of Cincinnati.

Pharis Tire & Rubber Co., Newark, has announced that longer wear, better service, and improved quality can be expected from Pharis bicycle tires in the future, as a result of newly installed manufacturing equipment in the company's reconverted and redesigned Plant No. 2. Since the acquisition of additional warehouse space in a RFC building, purchased since the war by Pharis, an entirely redesigned bicycle tire manufacturing plant has started production. Here Pharis Lightning, Lightning Motorbike, and special-brand tires are being built. Sixty-four molds are constantly turning out Pharis Lightning and Lightning Motorbike tires, the Pharis tires with the sidewall tread. Others are fitted for custom tread patterns. Simplicity in handling all components is one of the principal features of the new facilities.

Mayor James E. Neighbor of Newark, is the "newest" member of the 25-Year Club at Pharis Tire. He is the twenty-seventh initiate to enter the organization founded by 10 workers in January, 1946.

Firestone Liberian Film Preview

A preview of a new Firestone sound-film in color, entitled "Liberia—Africa's Only Republic," was held for members of the daily press and business and trade paper editors at the Monte Carlo Restaurant in New York, N. Y., December 10.

In October, November, and December of 1946, Charles Morrow Wilson—newspaperman and author—supervised the taking of 27,000 feet of motion-picture film depicting every step taken from the clearing of the jungle for the establishment of rubber plantations to the shipping of rubber across the Atlantic. The picture also included sequences based upon typical activities of Liberian natives. Typical plantation scenes depicted planting the seed of *Hevea* rubber in nursery beds, budgrafting, tapping rubber trees, and the processing of latex and bulk rubber.

In 1945, Mr. Wilson lived in Liberia for several months while gathering the information contained in his new book, also titled "Liberia—Africa's Only Republic." Copies of the book were distributed at the press preview, and the book will be reviewed soon in INDIA RUBBER WORLD.

Seven separate films are being assembled from the total footage exposed. "Liberia—Africa's Only Republic" is the longest and most complete; it runs for 55 minutes (2,000 feet). It will be distributed throughout the United States in neighborhood theaters, through Y.M.C.A. booking services, and special showings may be arranged through Firestone district offices.

Six short films will be adapted for specialized distribution:

1. "Firestone in Liberia"—900 feet, 25 minutes—a short version of the 55-minute film for use by luncheon and service clubs.
2. "Rubber from Liberia"—1100 feet, 30 minutes—an educational film especially adapted for showings to Firestone employes, suppliers, customers, and to other industrial organizations.
3. "Medicine in the Tropics—900 feet, 25 minutes—a featurette edited for use by medical associations, hospitals, medical and nurses training schools.
4. "Trade School in Liberia"—370 feet, 10 minutes—educational-type film showing use of modern training techniques among native Liberians.
5. "Liberia Plays"—370 feet, 10 minutes—a film for public school distribution depicting folk arts, dances, and crafts.
6. "Liberia's Democracy"—370 feet, 10 minutes—a special film made of the operation of the Liberian government showing the legislative, judicial and executive branches of the government in action.

Distribution of these seven motion pictures is a public relations activity of the Firestone Tire & Rubber Co., Akron. It was stated that it is hoped that these pictures will better acquaint all who see them with the story of rubber and the story of the economic and social progress of the Liberian republic.

The Firestone plantations in Liberia includes 80,000 acres and more than 10 million trees ranging in age from one to 21 years. Budded rubber comprises 80% of the present productive acreage of 60,000. Plant research work will eventually result in obtaining yields of from 1,000 to 1,500 pounds of rubber per acre in contrast to the 350 to 500 pounds, which was the average yield of ordinary seedling rubber trees in the past. In 1944, 36,000,000 pounds of rubber were produced from 50,000 acres of rubber trees of varying ages, and in 1946 the output totaled 49,000,000 pounds from 60,0000 acres.

In operating its plantations the company conducts practically all of the services found in an American city of 50,000 inhabitants. It operates its own water purification and supply systems, maintains a sanitation and public health program under the supervision of its medical director, and practices preventive medicine on a scale exceeded only by government agencies in Africa.

Firestone has more than 25,000 Liberian employes on its payroll. The supervisory staff includes 150 Americans who live in modern American homes. Transportation for people and products is provided by some 250 automobiles, buses, and trucks; 195 miles of first-class roads link the various sections of the plantations. In addition Firestone has contributed about $100,000 to extension and betterment of government roads.

The Firestone plantations resulted from a world-wide investigation carried out by Harvey S. Firestone, Jr., in the early 1920's and a recommendation of the late Harvey S. Firestone, Sr., to Secretary of State Charles Evan Hughes in 1924, in which he said:

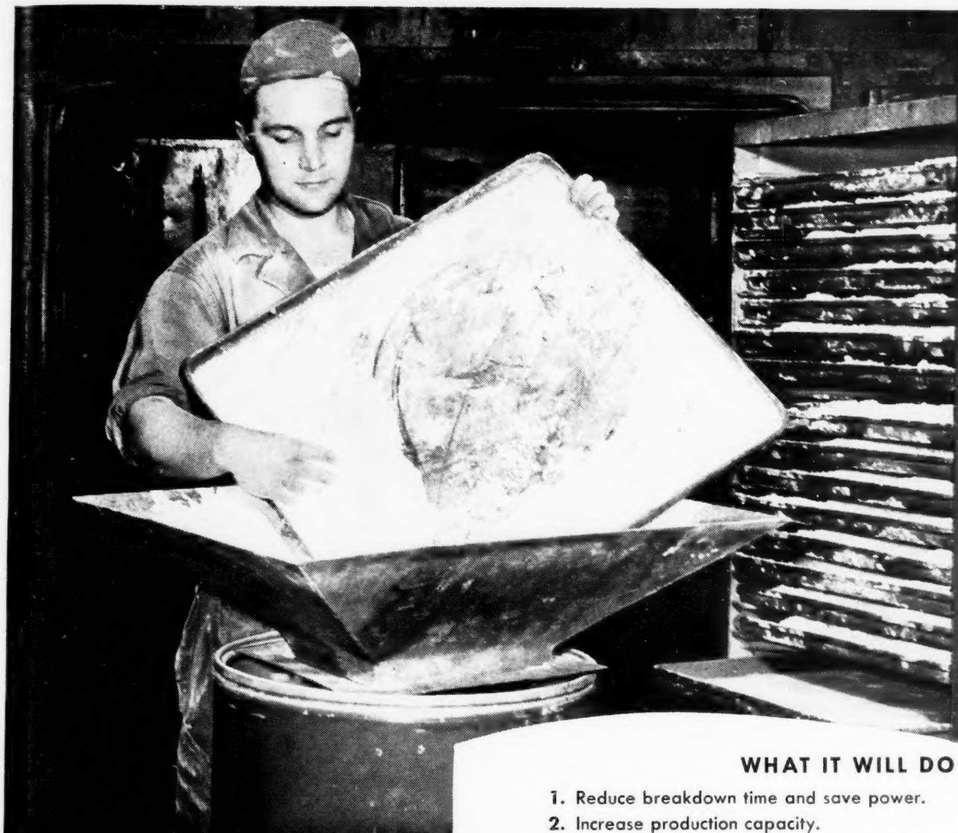
"If the rubber industry could be developed in Liberia on a large scale, it would not only bring relief to the United States for commercial purposes, but it would be a safeguard in time of national emergency."

Events during the past two decades have certainly borne out Mr. Firestone's prophecy. From the time of the Japanese seizure of Singapore and the Dutch East Indies until V-J Day, the Firestone Plantations Co. was the sole producer of concentrated natural latex for the United Nations. Shortly before Pearl Harbor, Firestone began construction of a large airport adjacent to its plantations. This airfield, named J. J. Roberts Field in honor of the first president of Liberia, was built in record time and proved to be highly useful in the ferrying of bombers to North Africa and the Middle East.

For Retreading Farm Tires

Increased use of rubber tires on farm implements has taught the American farmer the wisdom of having his worn agricultural tires retreaded. Such retreads give new tire performance at savings of fully 50% of the price of a new tire. Firestone now has a large number of tractor retread shops manned by factory trained experts and concentrated in agricultural areas. In addition to these shops, factory service is provided at Akron, Memphis, and Los Angeles where odd sized tires and special-type tires, such as Spade Grip, rib implement, and garden tractor tires, are retreaded. Two-hour retread service is possible at the company's shops. The Firestone dealer or store also has an exchange plan whereby the farmer pays the retread cost and trades his tire carcass for a newly retreaded tire.

Crown Rubber Co., Fremont, has appointed George W. Lumm general sales manager of the company and assistant to President Robert P. Johnson, who is also head of the Fremont Rubber Co. Mr. Lumm, a graduate mechanical engineer, had previously been employed for several years by Standard Oil Co. of Ohio as an industrial engineer and also in a sales capacity. He also taught engineering subjects in Toledo technical schools and served as engineering consultant for several firms in Toledo.



Transferring PEPTON 22 Plasticizer from trays in drying oven to drum at Calco plant.

PEPTON* 22 PLASTICIZER

WHAT IT WILL DO

1. Reduce breakdown time and save power.
2. Increase production capacity.
3. Produce softer Natural rubber or GR-S in a given milling time.
4. Produce soft GR-S with plasticities which show no appreciable change on standing.
5. Control GR-S gel build-up in hot processing.
6. Plasticize reclaimed rubber, mixtures of reclaimed rubber and Natural rubber or GR-S, and also mixtures of Natural rubber and GR-S.
7. Produce softer or more plastic Natural rubber or GR-S mixed stocks in direct mixing.
8. Reduce heat developed in processing and thereby lower the processing temperatures.
9. Improve processing qualities and reduce rejects.
10. Give good physical properties.

Excellent for Sponge Rubber

WHAT IT WILL NOT DO

1. It will *not* produce dermatitis or toxic effects.
2. It will *not* discolor white or light-colored stocks.
3. It will *not* bloom.
4. It will *not* affect aging adversely.

PEPTON 22 Plasticizer, now available in pilot plant quantities, can be supplied in unlimited quantities effective January 1, 1948.

SALES REPRESENTATIVES AND WAREHOUSE STOCKS: Akron Chemical Company, Akron, Ohio • Ernest Jacoby & Company, Boston, Mass. • Herron & Meyer of Chicago, Chicago, Ill. • H. M. Royal, Inc., Los Angeles, Calif. • H. M. Royal, Inc., Trenton, N. J. • In Canada: St. Lawrence Chemical Company, Ltd., Montreal and Toronto

*Reg. U. S. Pat. Off.

Calco

RUBBER CHEMICALS DEPARTMENT

CALCO CHEMICAL DIVISION

AMERICAN CYANAMID COMPANY

BOUND BROOK, NEW JERSEY

NOW AVAILABLE

MBT (MERCAPTOBENZOTHIAZOLE)

Ton lots	27¢ per lb.
Less than ton lots	29¢ per lb.

MBTS (BENZOTHIAZYLDISULFIDE)

Ton lots	35¢ per lb.
Less than ton lots	37¢ per lb

Add 1 cent per lb. for West Coast.
Shipments FOB, Bound Brook. Freight allowed.
Shipments from warehouse points FOB warehouse.
Terms: Net cash 30 days.

Calco

RUBBER CHEMICALS DEPARTMENT

CALCO CHEMICAL DIVISION

AMERICAN CYANAMID COMPANY

BOUND BROOK • NEW JERSEY

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Opens Latex Creaming Plant; Other Goodyear Notes

A new latex creaming plant was recently completed in Malaya by Goodyear Tire & Rubber Co., Akron, it was announced by P. W. Litchfield, chairman of the board. The new factory is in Rengam, Johore, and operations are already under way. J. J. Blandin, vice president of Goodyear Rubber Plantations Co., announced that the new operations will be directed by Richard C. Arnold, resident director, and his assistant, Claude E. Titus, both with headquarters in Singapore. John J. Riedl has been appointed chief chemist, with headquarters in Rengam. Goodyear is operating a fleet of auto tank trailers in Malaya to transport natural latex from independent plantations to the processing plant. A separate unit, comprising a bulk storage plant and ship loading facilities, has been installed in Singapore. From Singapore, the creamed latex is shipped in tank steamers to Baltimore, Md., where Goodyear has receiving facilities, and then transported to the company's Akron plant in railway tank cars.

Goodyear, because of expanding business in the Indianapolis, Ind., area, has under construction at 16th at Harding Sts. a new building to house the local district office and warehouse. The one-story structure will contain approximately 31,000 square feet, to be ready about April 1.

Personnel Changes

R. M. Hudak recently was made superintendent of production services for Goodyear's Akron plants. Mr. Hudak came to the rubber company immediately after his graduation from Ohio State University in 1929 and served in wage efficiency and time study. Then in 1939 he was named personnel manager of the Kelly Springfield Tire Co., Goodyear subsidiary at Cumberland, Md. In 1945, however, he was transferred to the plant managership of the Defense Plant Corp. unit near Waco, Tex., and returned to Cumberland after the war, when he became assistant to the president there.

H. A. Brittain, general superintendent of Goodyear's plant in Wolverhampton, England, has returned to Akron to a new post as assistant to G. K. Hinshaw, vice president and production manager of Goodyear foreign operations. Mr. Brittain went to England in 1936 as manager of the technical division at the Goodyear factory and three years later became plant superintendent. His successor in England is H. L. Ginaven.

Built in 1927, Goodyear's Wolverhampton plant was England's second largest producer of tires for mechanized units during the war.

While in England, Mr. Brittain served the British war effort in several ways. He was chairman of the factory advisory committee of the Tire Manufacturers conference, an advisory group to the government, and he was a member of the National Joint Industrial Council. Born in Canada, he joined Goodyear as a machine designer in 1918. Prior to going to England he was in charge of passenger and bicycle tire design in Akron.

R. S. Wilson, Goodyear vice president in charge of sales, spoke on "College Training for Professional Salesmanship" before a meeting of the Canadian Sales & Advertising Club in Toronto, Ont., November 25. Mr. Wilson stressed the need for salesmanship to be elevated to the status of a profession and gave his view of the basic and elective courses that should be offered in college to train professional salesmen.

Goodyear recently awarded service pins to the following veteran employes: *30 years*, A. L. Herzog, district store supervisor at Los Angeles; J. A. Bailey, manager of the South Central division; C. C. Hall, master mechanic, farms in Litchfield Park, Ariz.; S. E. Aiguier, assistant district manager in Oklahoma City; J. G. Crane, field representative for shoe products in Boston; *35 years*, E. G. Schick, field representative for Pliofilm sales at Philadelphia; A. Jae Sears, sales department.

New Developments Announced

A complete new line of tires designed for midget racing automobiles has been announced by Goodyear. The new tires, called "Racer," have flat treads with one shoulder rounded and the other square and higher than the rounded shoulder. Currently in production and available are four of the most popular sizes; 4.00-12, 4.50-12, 5.00-12, and 5.50-12, all in four-ply construction and with smooth treads. Two low-profile, extra-wide tread tires, sizes 4.50-12 and 5.00-12, designed for use on rear wheels of midget racers on hard surface tracks, are scheduled for production by early 1948. Tires in these same two sizes, in the company's All-Weather diamond tread, especially for use on dirt tracks, will also become available by the end of the year. The company's popular 4.00-12 four-ply All-Weather continues in the line for use on front wheels on dirt tracks. All of the smooth-tread tires in the new "Racer" line are suitable for grooving where drivers desire to have their own anti-skid patterns put in the tread. Distribution of the "Racer" line of tires and appropriate tubes to midget racing car operators will be through Goodyear's regular tire dealer organization.

Goodyear chemical engineers have given porcelain enamel coatings wide and versatile usage in their chemical manufacturing and synthetic rubber processes, according to J. D. Wilkerson, of the company's chemical engineering division. Although the synthetic rubber operation has been the greatest user of this equipment since its development a few years ago, Pliofilm is fast becoming a big user of porcelain enamel for its processing. Porcelain enameled reactors, piping, valves, and fittings are standard equipment for synthetic rubber polymerization work because of their resistance to corrosion. Other advantages include ease of cleaning and freedom from product contamination. The linings have given satisfactory service for latex preparation at pH ranges of 5-10 and at temperatures up to 140° F. Goodyear engineers, faced with the problems of huge war production schedules for synthetics, called on porcelain enamel coatings to cut down stoppages because of corroded or clogged vessels. Enameled linings have also proved satisfactory for acid coagulating liquids containing up to 2% sulfuric acid or hydrochloric acid, with various concentrations of sodium chloride, various dilute alum solutions, and acetic acid, at temperatures up to 175° F. The coatings have been used extensively to protect equipment used in the reaction of dry chlorine gas with aromatic hydrocarbons at temperatures up to 330° F. In addition, company engineers have found many specialty uses for porcelain enameled equipment and auxiliaries in its chemicals and plastics manufacturing processes.

Goodyear's New "Racer" Tire for Midget Racing Cars

Goodyear belting engineers have developed a new type of impact cushioning idler for belt conveyers. The idler is non-pneumatic and consists of rubber rings mounted on the idler core instead of the conventional rubber-covered steel idler. Maximum deflection is about six times greater than with the conventional idler, according to W. P. Hallstein, assistant manager of the company's belting department. The high resiliency of the rubber rings, solves the impact problem and materially increases the life of even top-quality belts, Mr. Hallstein indicated. The new device is an adaptation of the principle which led to using a battery of pneumatic tires, mounted on shafts revolving in bearings, to protect belts at dumping points in coal and ore mining. The rubber ring idler is designed for less severe impact conditions. Goodyear has contracted to make the molded rubber rings for several belt conveyer equipment companies.

Pliofilm, the transparent and moisture-proof film made by Goodyear, is once again available to fabricators for use in shower curtains, rainwear, garment bags, ladies' accessories, and the like. Withdrawn from this field at the outbreak of the war, Pliofilm since the end of the war has been available only to the food packaging industry. According to A. F. Landefeld, manager of the Pliofilm department of the chemical products division, the product will be made available initially to those companies which before the war had been listed as Pliofilm fabricators for these other products.

More than 200 portable, two-bedroom homes built by Wingfoot Homes, Inc., Goodyear's housing subsidiary, were shipped to dealers throughout the country during October. In making the announcement J. C. Thomas, Wingfoot vice president, said that production in plants at Litchfield Park, Ariz., and East St. Louis, Ill., will soon reach a total of 15 homes daily. Both plants are operating on a six-day schedule. Of the October shipments, 24 homes were sent to Frank Jacobs for a special two-block housing development in Chandler, Ariz. Another large development of Wingfoot homes will be placed in the vicinity of Williams Field, at Chandler, by Sun Valley Homes, Inc., of Phoenix, Ariz. Approximately 100 houses will be included in this group which has already been granted FHA and local bank approval. Wingfoot homes are distributed through nearly 200 dealers in all parts of the country.

PACIFIC COAST

W. J. Voit Rubber Corp., Los Angeles, Calif., had a routine fire drill at its plant turn into a near riot on November 14. At the first alarm bell 500 employes marched out of the plant in orderly fashion. When the second bell rang some minutes later, the employes marched back into the plant, and pandemonium broke loose. From every nook and cranny of the building there tumbled a profusion of pennies. The pennies turned up in the molds, machinery, assembly lines, chutes, packing cases, desks, papers, and in every obscure and surprising place in the large three-story factory. Some 15 minutes of scrambling and searching netted Voit employes over $300 worth of pennies which apparently had been planted during the fire drill. No explanation for the phenomenon was offered to its employes by the company, but a company spokesman "confided" to reporters that the penny hunt was the beginning of a campaign to prevent waste. Said Page Parker, Voit vice president in charge of production.

"We are going to demonstrate that a couple of million pennies can be saved each year by each worker's more effective use of his time and materials. Most of the thousands of dollars we can save are lying right under our noses."

Voit recently opened new offices and a warehouse at 251 Fourth Ave., New York 10, N. Y., headed by Vic Adams, eastern district manager. The new quarters cover more than 5,000 feet of floor space. Shipments are leaving the Los Angeles plant daily for the new shipping point in New York. According to company officials, this new arrangement will provide faster service and effect considerable freight savings for Voit's eastern distributers.

H. M. Royal, Inc., has installed a complete rubber and plastics testing laboratory as a result of the continued growth of rubber and plastics manufacturing activity in the southern California area. The laboratory is located in the company's warehouse at 4814 Loma Vista Ave., Los Angeles, and began operations on the first of the year. Since Royal represents such companies as John Royle & Sons, Scott Testers, Inc., and Wm. R. Thropp & Sons Co., the laboratory serves the dual purpose of a showroom for the machinery Royal handles in the territory and a service laboratory made available to the company's regular raw materials customers.

CANADA

Polymer Expanding

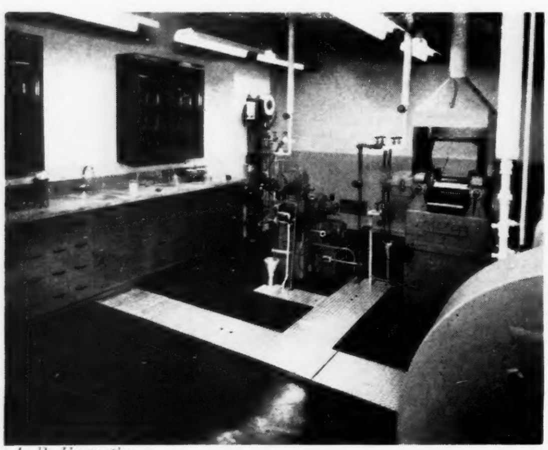
Polymer Corp., Sarnia, Ont., through President E. J. Brunning announced that the board of directors has authorized the expenditure of "several millions" for additional facilities. Although noting the problems confronting the company in its transition from a one-purpose war plant to a multi-purpose peacetime plant, the board is confident these problems will be solved and "firmly believes" that Polymer will be in an excellent position by 1949. Mr. Brunning also said that Polymer's policy will be to develop further base chemicals from raw materials with the object of attracting more industries to the Sarnia area. Polymer will produce a variety of tailor-made products, each designed for a specific purpose and each designed to do a better job than competitive raw materials. The company will place particular emphasis on the quality of these products, and Mr. Brunning said it is "our earnest hope that our able research department will, before long, be producing a rubber which is in many ways superior to the natural product."

Polymer, in conjunction with the Hydro-Electric Power Commission of Ontario, has announced the completion of negotiations for the purchase by the Commission of approximately 30,000 horsepower from Polymer. The contract has been made for a 10-year period and will go into effect as soon as the necessary new facilities have been installed. It is expected that Hydro will be ready to draw the power from Polymer by October 1, 1948. With its own steam and power plant, Polymer has supplied its own 60-cycle power and has also supplied small quantities of power to one of the new industries near the Polymer plant. When Polymer power becomes available, it will help meet the steadily increasing demands in Western Ontario, particularly in the Sarnia area where many large new industries are being established. A number of these industries will require 60-cycle current which Hydro will supply from power purchased from Polymer. The contract provides that Polymer will supply about 4,000 horsepower on a continuous basis throughout the year and will supply an additional 26,000 horsepower during periods of peak load, as required by the Commission.

On December 16, William J. Dyke, secretary, became secretary-treasurer of Polymer Corp., it was announced by J. R. Nicholson, executive vice president of the company, who also reported the appointment of P. C. Browne, cashier, to the newly created post of assistant to the treasurer. The new secretary-treasurer will replace Ian Cameron, Polymer treasurer, who has resigned from the company so that he and his family could return to Toronto, where Mr. Cameron has several interests.

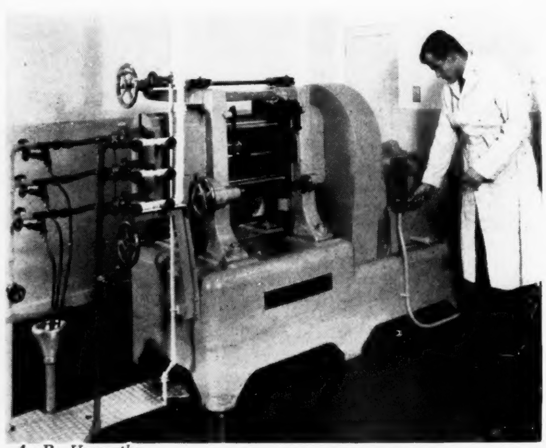
Mr. Dyke, a native of Fort William, Ont., in 1940 was graduated from the University of Manitoba as a bachelor of arts. Three years later he was graduated from Osgoode Hall Law School in Toronto and was called to the bar in Ontario. He joined Polymer on October 1, 1943, as assistant to Mr. Nicholson, then managing director and secretary. In August of the following year Mr. Dyke became assistant secretary of the company and on April 11, 1945, secretary. Keenly interested in community welfare, Mr. Dyke is a director and treasurer of the Victorian Order of Nurses, Sarnia Branch, and an executive member of the Sarnia branch of the Canadian Red Cross Society. He was the first president of the Polymer Social & Athletic Association.

Mr. Browne was born in Toronto. After graduation from Parkdale Collegiate, he took extension courses at the University of Toronto in accounting and the analyzing of financial statements. For 14 years he was associated with Canada Life Assurance Co., Toronto. After several years as assistant manager of the policy loan department, he became secretary of the Provident Investment Co., Mr. Browne later was a partner in the firm of Fortier & Browne, industrial mortgage investors, and before joining Polymer as



A. R. Hromatka

General View of H. M. Royal's New Rubber and Plastics Testing Laboratory



A. R. Hromatka

T. W. Andrews, in Charge of Equipment Sales, Operates Calender in New Laboratory

cashier in June, 1942, he had been associated with Stewart & McNair, investment counsellors. An ardent gardener, Mr. Browne is secretary of the Sarnia Horticultural Society and for several years has been writing gardening articles for Canadian newspapers.

Mr. Cameron is a native of Edinburgh, Scotland. After graduation from the Edinburgh Academy, he served with the Royal Bank of Scotland both in Edinburgh and in London. In 1929 he came to Canada and became associated with the Canadian National Exhibition. On January 2, 1943, he joined Polymer as assistant to the controller. He successively held the posts of assistant controller and assistant treasurer, and on June 27, 1946, became treasurer.

Ross with Drake Canada

Col. George L. Artamonoff, president of of Drake America Corp., 15 Broad St., New York 5, N. Y., on December 1 announced that Herbert S. Ross, export manager of Armstrong Rubber Export Corp., has been appointed executive vice president in charge of sales of Drake Canada, Ltd., Montreal, P. Q. Mr. Ross, a native of Montreal, is a veteran of the United States Army Air Forces. He was employed formerly by Rogers International Corp. Both Rogers International and Armstrong Rubber Export are subsidiaries of Drake America.

Albert E. Viterbo has been named export manager of Armstrong Rubber Export Corp., Colonel Artamonoff said. Mr. Viterbo formerly was with the World Commerce Corp. and Block International Corp.

Drake Canada, a subsidiary of Drake America, is an international trading company engaged in importing and exporting and in the distribution in Canada of imported products and commodities. The firm is affiliated with Fendrake Trading Co., Ltd., of London, and with Drake trading companies in the Argentine and Brazil.

Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., has elected J. G. Williams comptroller and assistant secretary. Transferred to the Canadian plant in 1946, during the war Mr. Williams had been assistant comptroller at Goodyear Aircraft Corp., Akron, O., U.S.A.

OBITUARY

Ralph V. Kline

THE president and general manager of Morenci Rubber Products, Inc., Morenci, Mich., Ralph Vernon Kline, died on November 23 of cancer. Born in Akron, O., March 13, 1891, Mr. Kline attended elementary and high school followed by a business school course.

His long association with the rubber industry started in 1914 when he was employed by U. S. Rubber Reclaiming Co. Remaining with this company until 1922 he next joined Hewitt Rubber Co. In February, 1927, Mr. Kline resigned to become rubber division superintendent of the Fowler & Union Horse Nail Co. He stayed with this company until 1936 when it merged with Capewell. He then took a position as general manager with Mogul Rubber Corp. and at the time of his resignation from that company in 1944 he had become vice president and general manager. In May, 1945 he became associated with Morenci.

Mr. Kline, a Mason, was a member of the Scottish Rite consistory at South Bend, Mizpah Temple, A. A. O. N. M. S. at Fort Wayne, Order of the Eastern Star, Excelsior Chapter No. 68, Morenci, Goshen Lodge, and No. 798 B. P. O. E.

Funeral services were on November 24 at Morenci in charge of Excelsior Chapter No. 68, O. E. S., and at Buffalo, N. Y., on November 25 by Modestia Lodge No. 340, F. & A. M. Burial was on November 26 at Acacia Park Cemtery, Tonawanda, N. Y.

Surviving the deceased are the widow, daughter, two sisters, and two brothers.

CALENDAR

Jan. 6-Feb. 21.	Salvation Army's 1948 Drive.
Jan. 8.	Quebec Rubber & Plastics Group. Ritz Carlton Hotel, Montreal, P. Q., Canada.
Jan. 8.	Central Ohio Section, S.P.E. Wagner House, Newark, O.
Jan. 9.	Chicago Section, S.P.E. Annual Party. Edgewater Beach Hotel, Chicago, Ill.
Jan. 12-16.	Society of Automotive Engineers. Annual Meeting. Book-Cadillac Hotel, Detroit, Mich.
Jan. 12-16.	Second National Materials Handling Exposition. Public Auditorium, Cleveland, O.
Jan. 14.	Newark Section, Society of Plastics Engineers. Newark Athletic Club, Newark, N. J.
Jan. 14.	Rhode Island and Southeastern Massachusetts Section, S.P.E. Providence Engineering Society Bldg., Providence, R. I.
Jan. 15.	Philadelphia Section, S.P.E. Ladies' Night.
Jan. 19-23.	Bicycle Institute of America. Annual Convention. Flamingo Hotel, Miami Beach, Fla.
Jan. 20.	Rochester Section, S.P.E.
Jan. 21-23.	S.P.E. National Conference. Horace H. Rackham Educational Memorial, Detroit, Mich.
Jan. 29.	Northern California Rubber Group. Hotel Cleremont, Oakland, Calif.
Feb. 1-6.	National Sporting Goods Association. 1948 Convention. Hotel New Yorker, New York, N. Y.
Feb. 3.	Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
Feb. 6.	Akron Rubber Group.
Feb. 6.	Chicago Rubber Group. Morrison Hotel, Chicago, Ill.
Feb. 11.	Newark Section, S.P.E.
Feb. 11.	Rhode Island and Southeastern Massachusetts Section, S.P.E.
Feb. 12.	Quebec Rubber & Plastics Group. Ritz Carlton Hotel, Montreal, P. Q., Canada.
Feb. 13.	Connecticut Rubber Group.
Feb. 14-22.	National Sportsmen's Show. Grand Central Palace, New York, N. Y.
Feb. 17.	Rochester Section, S.P.E.
Mar. 1-31.	Red Cross 1948 Fund Appeal.
Mar. 1-6.	A.S.T.M. Committee Week. Washington, D. C.
Mar. 2.	Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
Mar. 10.	Newark Section, S.P.E.
Mar. 10.	Rhode Island and Southeastern Massachusetts Section, S.P.E.
Mar. 11.	Quebec Rubber & Plastics Group. Ritz Carlton Hotel, Montreal, P. Q., Canada.
Mar. 16.	Rochester Section, S.P.E.
Mar. 19.	Boston Rubber Group. Spring Meeting. Somerset Hotel, Boston, Mass.
Mar. 26.	Chicago Rubber Group. Morrison Hotel, Chicago, Ill.
Apr. 19-23.	American Chemical Society. Spring Meeting. Chicago, Ill.

FINANCIAL

Anaconda Wire & Cable Co., New York, N. Y. Nine months to September 30: net income, $6,492,996, equal to $15.39 each on 421,981 capital shares, contrasted with $2,100,301, or $4.98 a share, in the corresponding period last year.

Belden Mfg. Co., Chicago, Ill. Nine months to September 30: net profit, $989,105, equal to $3.39 a share, compared with $523,363, or $1.79 a share, in the same 1946 period.

Crown Cork & Seal Co., Inc., Baltimore, Md., and wholly owned subsidiaries: Nine months ended September 30: net income, $3,039,095, equal to $4.44 each on 603,895 common shares, compared with $2,031,519, or $2.68 a share, in the like period last year; sales, $59,956,582 (a new high), against $45,677,693.

DeVilbiss Co., Toledo, O., and wholly owned subsidiary. Nine months to September 30: net income, $561,464, equal to $1.87 a share, against $660,809, or $2.14 a share, in the 1946 period.

New Jersey Zinc Co., New York, N. Y. First three quarters, 1947: net profit, $6,213,848, equal to $3.17 a share, compared with $3,434,010, or $1.75 a share, in corresponding period last year.

Rome Cable Corp., Rome, N. Y. Twelve months to September 30: net profit, $1,439,464, equal to $3.59 a common share.

Socony-Vacuum Oil Co., Inc., New York, N. Y. First nine months, 1947: net profit, $66,000,000, equal to $2.12 a share, compared with $36,000,000, or $1.12 a share, in the corresponding months last year.

(Continued on page 550)

Patents and Trade Marks

APPLICATION

United States

2,429,625. **A One-Piece Tubular Body of Thin Elastic Waterproof Material to Protect Hosiery.** J. E. Horn, New York, N. Y.

2,429,626. **Sponge Rubber Mop.** J. E. Horn, New York, N. Y.

2,429,678. **In a Roller Skate Including a Foot Plate Supported by a Truck, a Resilient Rubber-Like Member Interposed between Truck and Footplate for Normally Positioning the Foot Plate in a Plane at a Given Angle Relative to the Truck.** G. L. Fuller, Cleveland Heights, O.

2,429,688. **Fuel Tank.** W. R. Hoover, Mishawaka, Ind., assignor to United States Rubber Co., New York, N. Y.

2,429,825. **In a Welding Electrode Holder Including a Body Member for Holding the Electrode, a Cap for the Body Member and a Plunger Mounted in a Bore in the Cap, a Resilient Rubber Washer, the Resiliency of which Aids in the Ejection of the Electrode from the Body Member.** H. R. Kruitbosch, assignor to Electroloy Co., Inc., both of Bridgeport, Conn.

2,429,857. **Rubber Insulator for Wires of Electric Fences.** J. F. Verner, Pocahontas, Iowa.

2,429,866. **In a Prosthetic Appliance Including an Arm Having a Pair of Flexible Jaws, Fluid Pressure Means for Contracting These Jaws.** A. Broste, Victoria, B. C., Canada.

2,429,869. **Syringe Bag of Cured Plastic Material.** C. J. Crowley, assignor to Seamless Rubber Co., both of New Haven, Conn.

2,429,897. **Composite Article Including a Body of Vulcanized Rubber, a Second Body, a Crazed Film of Cyclized Rubber, and a Set Film of Cement Bonding the Second Body and the Cyclized Rubber Film.** S. G. Saunders, Bloomfield Hills, and H. Morrison, Detroit, assignors to Chrysler Corp., Highland Park, all in Mich.

2,429,935. **In Making Crinkled, Non-Creped Cloth, the Use of a Hardenable Melamine Formaldehyde Resin Resist on Localized Areas.** A. S. Jones, Dudley, and G. B. Stackpole, Oxford, both in Mass., assignors to Cranston Print Works Co., Cranston, R. I.

2,429,958. **Means Facilitating Stacking of Containers Including Cushion Vibration Insulating Rings of Resilient Material Mounted on the Base Portion and the Outer Face of the End Closure** A. G. Liebmann, assignor of one-half to H. A. Blessing, both of Washington, D. C.

2,429,983. **Milking Apparatus.** L. F. Bender, Waukesha, and J. A. Schmitt, Milwaukee, assignors to Universal Milking Machine Co., Waukesha, both in Wis.

2,429,992. **Deflatable and Retractable Wing Pontoon or Float.** L. N. Crispell, Kingston, Pa.

2,429,993. **Rubber V-Belt with Sections Enclosed in a Seamless, Preformed Sleeve of Woven Metal Cloth.** M. A. Crosby, assignor to Dayton Rubber Co., both of Dayton, O.

2,429,994. **Cog V-Type Belt of Rubber with a Cover of Woven Metal Cloth.** M. A. Crosby, assignor to Dayton Rubber Co., both of Dayton, O.

2,430,024. **V-belt of Rubber-Like Composition Having a Neutral Axis Section Including a Number of Longitudinally Placed Metallic Members to Which Transverse Metallic Members Are Secured.** E. L. Luaces and M. A. Crosby, assignors to Dayton Rubber Co., all of Dayton, O.

2,430,065. **For Packaging Coffee, a Container of Polyvinyl Acetals.** L. L. Leach, Swarthmore, Pa., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,430,199. **A Boot or Shoe Heel with Bar-Like Projections at the Sides so Arranged as to Create a Tapering Channel.** S. L. W. Fazakerley, Liverpool, England.

2,430,229. **Hearing Aid Earpiece.** E. L. Kelsey, Chicago, Ill., assignor to Zenith Radio Corp., a corporation of Ill.

2,430,328. **V-belt Construction Including an Outer Fabric Cover of U-Cross-Section and a Removable, Non-Metallic Fabric Core.** F. A. Daniels, Wilmington, Del.

2,430,374. **In an Electrolytic Alkali Chlorine Cell, an Improved Support for Cathode and Anode Assemblies Including Gaskets of Resilient Material and a Layer of Impervious Electrically Non-Conducting Pressure-Plastic Material to Protect Parts against Anodic Electrolysis.** K. E. Stuart, assignor to Hooker Electrochemical Co., both of Niagara Falls, N. Y.

2,430,378. **Composite Electric Cable Assembly Including Individually Insulated Conductors Held to a Sustaining Tension Element; These Conductors Are Twisted together in a Long Pitch Spiral; the Direction of the Twist Is Reversed at Intervals.** R. C. Waldron, Clifton, and T. L. Hall, Upper Montclair, assignors to Okonite Co., Passaic, all in N. J.

2,430,441. **In a Cap for Protecting the Nipple of Grease Fittings to Which Grease Guns Are Applied, an Absorbent Liner of Cork Having an Outer Protective Cover of Rubber or the Like.** S. Abramson, Renton, Wash.

2,430,445. **In an Air Seal Joint for Pressurized Wave Guide in a Radar Apparatus, a Sealing Ring Including a Metallic Spring Ring Formed of Superposed Staggered Rib-Shaped Portions, and a Ring of Elastic Material Vulcanized to the Spring with the Elastic Material Filling the Interstices between the Aforementioned Rib-Shaped Portions.** T. Aamodt, Bernardsville, and H. A. Hilsinger, Jr., East Orange, both in N. J., assignors to Bell Telephone Laboratories, Inc., New York, N. Y.

2,430,459. **Laminated Container of a Heat-Sealable Sheet Including a Relatively Dense Base Sheet, an Intercalated Flexible Thermoplastic Film, and a Thin Relatively Porous Tissue Sheet Adhered to the Film.** R. A. Farrell and C. L. Wagner, Menasha, Wis., assignors to Marathon Corp., a corporation of Wis.

2,430,466. **Air Boot Including a Hollow Inflatable Structure Having a Flat Bottom and an Open Recess Shaped to Fit a Shoe.** T. E. Hedman, Washington, D. C.

2,430,500. **Wire Reinforced Double Cog Belt.** A. L. Freedlander, D. L. Waugh, and E. H. Kremer, all of Dayton, O., assignors to Dayton Rubber Co., a corporation of O.

2,430,560. **Tire Casing.** S. M. Elliott, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,430,573. **Rubber Cushioning Members in a Self-Laying Track for Vehicles Having Track Blocks Hinged to Each Other.** A. S. Krotz, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,430,593. **Resilient Self-Locking Electrical Connector Including a Plug with a Body Formed of Resilient Insulating Material.** O. A. Windsor, Santa Monica, Calif.

2,430,663. **For Packaging Freshly Ground Roasted Coffee, a Bag of Gas Impervious Material in Which Is Disposed a Synthetic Resin Having Anion-Exchange Properties.** A. S. Behrman, Chicago, Ill.

2,430,709. **Resilient Mounting Including a Column of Rubber.** J. W. Devorss, Jr., Scarsdale, assignor to United States Rubber Co., New York, both in N. Y.

2,430,737. **Annular Resilient Rubber-Like Expansion Elements in an Adjustable Adapter for Mounting a Casting or the Like in the End of a Hollow Furniture Tube.** W. C. Roe, assignor to Colson Corp., both of Elyria, O.

2,430,739. **Trap Cleaner Including a Rubber Cup with a Shank Portion and a Flexible Skirt Portion and a Rubber Tube Connected to One End of the Shank.** W. H. Scott, Rochester, N. Y.

2,430,829. **Electric Weft Detector Finger for a Loom Including a Conducting Element to One End of Which Is Secured a Feller Tip made of Soft Electric Current Conducting Rubber.** V. F. Sepavich, assignor to Crompton & Knowles Loom Works, both in Worcester, Mass.

2,430,836. **Packing Structure for Use Between Two Cylindrical Telescoping Elements Including Nested Annular Rubber Rings of V-Cross Section.** S. V. E. Taylor, assignor to Cleveland Pneumatic Tool Co., both of Cleveland, O.

2,430,905. **Crashproof Liquid Container Including Flexible Walls Having Extensible Corrugations Extending Completely around the Container.** W. D. Bradley, South Bend, Ind., assignor to United States Rubber Co., New York, N. Y.

2,430,931. **Laminated Fuel Tank Including, as Essential Laminae, a Film of a Partial Acetal of a Polyvinyl Alcohol, a Layer of a Compounded Rubber-Like Vulcanizable Butadiene Copolymer, and a Layer of Natural Rubber.** A. Hershberger, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,430,999. **Bubble Forming Device Including a Nozzle of Flexible Resilient Material.** R. S. Skinner, Sentinel, Okla.

2,431,156. **Mechanically Actuated Fine Point Eraser.** A. W. Wonders, Gallup, N. Mex.

2,431,184. **Composite Propeller Blade Including an Abrasion Resisting Metal Sheet Covering One Side and the Leading Edge of the Blade, and a Resilient Compressive Non-Metallic Bonding Material between Blade and Sheet.** E. Martin, West Hartford, assignor to United Aircraft Corp., East Hartford, both in Conn.

2,431,192. **In a Dispensing Device Adapted to Be Attached to a Container, a Spout Tube Having a Perforated Intermediate Portion Enclosed in a Compressible Bulb.** C. E. Munson, Summit, N. J.

2,431,505. **Lady's Bathing Suit with an Upper Portion of Fabric Which Is Elastic Horizontally of the Suit.** R. M. Reid, Boise, Idaho.

Dominion of Canada

444,715. **In a Supporting and Bonding Block for Conduits, a Cushion of Elastic Insulation Material with a Plurality of Conduit Receiving Channels Extending across One Face thereof.** Adel Precision Products Corp., Burbank, assignee of L. P. Issoglio, Los Angeles, and H. R. Ellinwood, Burbank, both in Calif., U. S. A.

444,734. **Resilient Car Wheel Including Web and Rim Portions, a Hub, and Cushions of Rubber or the Like Interposed between Inner and Outer Face Plates.** Carnegie-Illinois Steel Corp., Pittsburgh, assignee of A. R. Schulze, Johnstown, both in Pa., U. S. A.

444,735. **In a Joint Including a Plurality of Overlapped Metal Elements, an Electric Current Layer therebetween; This Layer Includes the Dried Residue of a Natural or Synthetic Rubber Solution Having Electrolytic Iron Powder Dispersed therethrough.** Carrier Corp., assignee of W. L. McGrath, both of Syracuse, N. Y., U. S. A.

444,742. **Self-Sealing Fuel Tank.** B. F. Goodrich Co., New York, N. Y., assignee of J. M. Davies, J. J. Shipman, and W. L. Davidson, all of Akron, O., both in the U. S. A.

444,867. **In a Sand Trap, an Ejector Assembly Including a Venturi Throat of Rubber-Like Material.** New York Air Brake Co., New York, assignee of W. A. Baldwin, Watertown, both in N. Y., U. S. A.

444,925. **In a Decorative Fabric Having a Relief Design, a Layer of Foam Rubber Supporting the High Portions of the Design and Vulcanized to the Depressed Areas.** F. H. Untiedt, Chevy Chase, Md., U. S. A.

445,001. **In an Endless Track of the Locked Girder Type, an Encasement of Resiliently Deformable Material for the Abutment Surfaces of Adjacent Links Which Coact to Prevent Reverse Curvature, in Order to Render Them Inaccessible to Dirt.** Roadless Traction, Ltd., assignee of P. H. Johnson and L. W. Tripp, Hounslow, Middlesex, England.

445,014. **An Electrical Connector for Splice Connecting Circuit Wiring, Including a Flat Body of Rubber-Like Flexible Material Susceptible to Being Manipulated and Shaped by Hand to Conform to the Regular Surface of Any Structural Member on Which the Connector and Wiring May Be Placed in Service Position.** Thomas & Betts Co., assignee of G. C. Thomas, Jr., both of Elizabeth, N. J., U. S. A.

445,053. **In a Display Head, a Hair Simulating Portion Composed of a Base of Resilient Material Supported by the Head Shell.** L. L. Greneker, New York, N. Y., U. S. A.

445,064. **In Hydraulic Apparatus Having a Fluid Reservoir, Means for Varying the Air Space in the Reservoir as the Hydraulic Fluid Volume Is Varied, Including a Flexible Rubber Sack Suspended in the Reservoir Chamber.** H. E. Page, Alhambra, Calif., U. S. A.

445,091. **Self-Contained Breathing Lung.** Diving Equipment & Supply Co., assignee of Marine Equities Corp., formerly Diving Equipment & Supply Co., Inc., assignee of J. Brown, all of Milwaukee, Wis., U. S. A.

445,113. **Heavy-Current Flexible Cable Capable of Floating in Water.** W. T. Henley's Telegraph Works Co., Ltd., Derking, Surrey, assignee of W. C. Barry, Gravesend, Kent, both in England.

445,156. **For Inflatable Articles, a Valve with a Stem of Rubber or Like Material and a Self-Sealing Plug.** Sun Rubber Co., Barberton, assignee of F. Fenton, Akron, both in O., U. S. A.

United Kingdom

593,068. **Corrugated Tube.** United States Rubber Co.

593,121. **Resilient Suspension of Engines.** Metalastik, Ltd., and A. J. Hirst.

593,555. **Oil Sealing Ring.** General Tire & Rubber Co.

593,651. **Erasing Devices for Typewriters.** R. Jenny.

593,775. **Windshield Cleaner.** Trico Products Corp.

593,826. **Collapsible Boats.** J. Mandleberg & Co., Ltd., and J. G. Brown.

593,856. **Windshield Wiper.** Trico Products Corp.

593,937. **Electric Cables.** F. H. Wheeler & Co., Ltd., and D. F. Wheeler.

593,960. **Racket Press.** Dunlop Rubber Co., Ltd., and G. Vaughan.

593,996. **Expansion Joints in Concrete and Like Structures.** Universal Rubber Paviors, Ltd., L. Gaisman, and W. L. Scott.

594,049. **Self-Laying Tracks for Vehicle Wheels.** C. J. Dew and H. F. Liebrecht.

PROCESS

United States

2,430,033. **Hot Molding Polyvinyl Plastics.** T. F. Stacy, Piqua, O., and M. D. Farmer, East Aurora, N. Y. assignors to French Oil Mill Machinery Co., Piqua, O.

2,430,076. **Welding Sheet Rubber Such as Walls of Inner Tubes and Similar Sheet Materials.** J. L. Pollock, Los Angeles, Calif.

2,430,081. **Method of Making Flexible Tubes, Which Includes a Sleeve of Rubberized Fabric Surrounded by the Stretched Coils of a Helical Spring.** F. T. and R. E. Roberts, both of Ridgefield, Conn.

2,430,630. **Joining the Ends of Rubber Tubes.** C. H. Davis, Jr., East Gadsden, Ala.

2,430,934. **Synthetic Resin Floor Coverings.** J. W. Kemmler, Elkins Park, and E. R. Erb, Jr., Morrisville, both in Pa., assignors to Sloane-Blabon, Trenton, N. J.

2,431,042. **Clear Films from Solid Ethylene Polymers.** H. G. Ingersoll, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,431,085. **Sheathed, Buoyant Cable.** H. N. Shelmerdine and A. Cooper, assignors to Expanded Rubber Co., Ltd., all of Croydon, England.

2,431,315. **Forming Plastic Coating Compositions on Surfaces.** F. E. Drummond, assignor, by mesne assignments, to Chemical Developments Corp., both of Dayton, O.

Dominion of Canada

444,741. **Applying Polyvinyl Compound Recaps to Worn Carcasses.** Ford Motor Co. of Canada Ltd., Windsor, Ont., assignee of J. H. Doering, Detroit, and R. H. McCarroll, Dearborn, both in Mich., U. S. A.

444,801. **Removing Flash from Soft Rubber Molded Articles.** L. W. Lubenow, Orange, N. J., U. S. A.

444,962. **Vulcanizing Tubeless Tires.** Firestone Tire & Rubber Co., assignee of W. Brown, both of Akron, O., U. S. A.

United Kingdom

593,268-269. **Target Boards for Games or Sports.** Dunlop Rubber Co., Ltd., and G. Vaughan.

593,313. **Coating Articles with Synthetic Resins.** E. I. du Pont de Nemours & Co., Inc.

593,339. **Rubber Articles of Apparel.** Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges & Camargue.

593,407 and 593,456. **Molding and Vulcanizing Pneumatic Tires.** Firestone Tire & Rubber Co.

593,658. **Preparation of Dry Rubber from Latex.** British Rubber Producers' Research Association, G. Martin, W. G. Wren, and F. R. Stacey.

593,677. **Surface Treatment of Plastic Materials.** Distillers Co., Ltd., J. J. P. Staudinger, and H. M. Hutchinson.

593,799. **Milling Plastics.** Bakelite, Ltd.

593,860. **Articles Molded from Synthetic Resin Material.** J. Veit and J. F. Kenure.

593,901. **High - Frequency Electrostatic Heating of Plastics Especially in Connection with the Molding thereof.** H. F. MacMillin.

593,916. **Laminated Tubes.** B. Jablonsky.

CHEMICAL

United States

2,429,679. **Film-Forming Composition Including a Cellulose Acetate or Ethyl Cellulose and, as Plasticizer therefor, a Morpholide of an Organic Acid.** L. W. Georges, New Orleans, assignor to The United States of America, as represented by the Secretary of Agriculture.

2,429,698. **Producing a Gasoline-Resistant Coating on a Surface by Spreading thereon a Liquid Mixture of an Organic Polysulfide Polymer and an Accelerator from the Group of the Oxides and Peroxides of Copper, Manganese, Calcium, Magnesium, and Zinc, and Then Exposing the Coating to the Action of a Promoter from the Group of Ammonia, Aliphatic Primary and Secondary and Tertiary Amines, Cyclic Amines and Their Aqueous Solutions.** W. K. Schneider, assignor to Stoner-Mudge, Inc., both of Pittsburgh, Pa.

2,429,719. **Unsaturated Dimer of an Alpha Alkyl Styrene.** A. B. Hersberger, Drexel Hill, and Randall G. Heiligmann, Yeadon, assignors to Atlantic Refining Co., Philadelphia, all in Pa.

2,429,838. **Synthetic Rubber-Like Material with High Oil and Freeze Resistance Which Is a Copolymer of 2-Fluoro-1,3-Butadiene and Acrylonitrile.** W. E. Mochel, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,429,858. **Improving the Processing Characteristics of Butadiene-Styrene Interpolymers by Incorporating a Compound of the Class of Additive Terpene Thioethers of Alpha-Mercapto Mono-Carboxylic Acids and the Zinc, Cobalt, and Manganese Salts thereof.** J. R. Vincent, Wilmington, and G. Etzel, Newark, assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, both in Del.

2,429,859. **Producing Pliable Resin Having Rubber-Like Resiliency by Reacting in Aqueous Medium an Alkali Metal Polysulfide with a Reactive Methylene Body from the Group of Formaldehyde, Paraformaldehyde and Alpha Polyixymethylene at between 20 and 40° C. and Gradually Adding during the Course of the Reaction a Substance from the Group of Carbon Dioxide, Sulfur Dioxide, and Sulfuric Acid.** J. F. Walker, Lewiston, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,429,861. **Coating Compositions of Polyethylene.** R. G. Woodbridge, III, Niagara Falls, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,429,883. **Alkyl-Dialkylaminosilanes.** O. K. Johannson, assignor to Corning Glass Works, both of Corning, N. Y.

2,429,963. **Polychlorinated Saturated Aliphatic Hydrocarbons.** O. Reitlinger, New York, N. Y.

2,430,016. **Treating a 1,2-Dihalobutene-3 with an Aqueous Solution of Alkali to Convert It to a 2-Halobutadiene-1,3.** G. W. Hearne, El Cerrito, and D. S. La France, Richmond, assignors to Shell Development Co., San Francisco, all in Calif.

2,430,032. **Adding a Soluble Dimethyl Silicone Elastic Product Prepared by Contacting a Liquid Dimethyl Silicone with Ferric Chloride to an Agitated Two-Phase Mixture of an Aqueous Phase and an Organic Solvent for the Elastic Product Immiscible with the Aqueous Phase.** D. W. Scott, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,430,053. **Polyvinyl Butyral - Resorcinol - Formaldehyde Adhesive.** A. Hershberger, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,430,109. **Solid Heat Convertible, Soluble, Fisible Polymerization Product of a Mixture of Divinyl Benzene and Diethyl Fumarate.** G. F. D'Alelio, assignor to Pro-phy-lac-tic Brush Co., both of Northampton, Mass.

2,430,123. **Forming an Insulating Material from a Semi-Liquid Mixture of a Hardenable Electrically Non-Conductive Binder and Minute Mica Flakes.** E. J. Jacob, Brooklyn, N. Y.

2,430,162. **Benzothiazyl Disulfide - Diaryl - Guanidine Derivatives.** A. R. Davis, Riverside, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,430,313. **Copolymer of Maleic Anhydride and a Polymerizable Mono-Ethylenic Hydrocarbon.** C. A. Vana, Brecksville, O., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,430,326. **Dichloropropylenes.** H. A. Cheney, Oakland, and S. H. McAllister, Lafayette, assignors to Shell Development Co., San Francisco all in Calif.

2,430,385. **Vulcanizate of Improved Tensile Strength Including a Compound Containing Butadiene-Styrene Copolymer, Non-Black Inorganic Filler from the Group of Calcium Carbonate and Magnesium Carbonate, Vulcanizing Agent, and Paracoumarone Resin.** T. A. Bulifant, Hackensack, N. J., assignor to Allied Chemical & Dye Corp., New York, N. Y.

2,430,395. **Separating Geometric Isomers of Piperylene from Each Other.** F. E. Frey, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,430,479. **Bonding Lamintes by Means of Isocyanates.** B. C. Pratt and H. S. Rothrock, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,430,481. **Preparing Rubber Products from Unpeptized Rubber Latex by Treating the Latex with Aqueous Hydrogen Peroxide.** C. Saint-Mieux, assignor to Société Meridionale du Caoutchouc Someca, Société à Responsabilité Limitée, both of Carcassonne, France.

2,430,556. **Rubber Composition Stabilized against Oxidation by a Natural Antioxidant-Containing Material Extracted from Crude Vegetable and Fish Oils and Vegetable and Fish-Oil-Bearing Solids.** L. O. Buxton, Maplewood, assignor to Nopco Chemical Co., Harrison, both in N. J.

2,430,562. **Polymerizing a Butadiene-1,3 Hydrocarbon in an Aqueous Emulsion in the Presence of a Water-Soluble Xanthate and an Oxygen Supplying Per-Salt.** C. F. Fryling, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,430,564. **Colorless, Hard, Rubbery Plastic and Elastic Resinous Material Consisting of the Copolymerization Product of a Dialkyl Ester of Maleic Acid, and Vinyl Acetate.** P. L. Gordon, New York, N. Y., assignor to American Waterproofing Corp., Brooklyn, N. Y.

2,430,590. **Polymerizing in Aqueous Emulsion a Mixture of Butadiene-1,3 and a Vinyl Compound in the Presence of an Oxygen-Supplying Initiator of Polymerization and a Catalytic Amount of an Auxin.** W. D. Stewart, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,430,591. **Polymerizing in Aqueous Emulsion a Butadiene-1,3 Hydrocarbon in the Presence of a Catalytic Amount of a Ureide Made by Condensing Urea with a Two-Carbon-Atom Carboxylic Acid from the Class of Glyoxylic Acid and Glycollic Acid.** W. D. Stewart, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,430,667. **Chlorination of a Solution of Furane.** O. W. Cass and H. B. Copelin, both of Niagara Falls, N. Y., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,430,726. **Moisture - Proofing Composition Including a Reaction Product of Rubber and a Phenol.** J. A. Mitchell, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,430,736. **Thermosetting Dry Powdered Adhesive Base Including, as a Resin Base, an Alkali-Catalyzed Heat Condensation Compound of Cresylic Acid, Furfural, and an Alkali-Dispersible Protein Modifier; and in Admixture with This Base, an Alkali-Dispersible Protein Extender.** D. V. Redfern, assignor to Adhesive Products Co., both of Seattle, Wash.

2,430,822. **Chlorinated Isopropyl Benzene.** J. A. Nevinson, Larsdowne, assignor to Atlantic Refining Co., Philadelphia, both in Pa.

2,430,859. **Sulfur Containing Polyamides.** T. Le S. Cairns, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,430,860. **Polyamide-Formaldehyde Reactions.** T. Le S. Cairns, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,430,866-867. **Granular N - Alkoxymethyl Polyamides.** H. D. Foster, Wilmington, Del., and A. W. Larchar, Mendenhall, Pa., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,430,874. **Ethyleneurea.** G. C. Hale, Dover, N. J.

2,430,907. **Nitrogen-Substituted Polyamides.** T. Le S. Cairns, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,430,908. **N-Alkoxymethyl Polyamides.** T. Le S. Cairns, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,430,910. **N-Alkoxymethyl Polyamides.** W. H. Church, Buffalo, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,430,919. **Polyvinyl Alcohol Composition Including Polyhydric Alcohol Plasticizer and Tetrahydrofurfuryl Alcohol.** C. Dangelmajer, Nutley, N. J., assignor to Resistoflex Corp., Belleville, N. J.

2,430,923. **N-Alkoxymethyl Polyamides.** H. D. Foster, Wilmington, Del., and A. W. Larchar, Mendenhall, Pa., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,430,926. **Plastic Composition Including a Cellulose Ester of a Saturated Straight-Chain Fatty Acid with, as Plasticizer, a Hexitol Ketal of a Chloroacetone.** R. M. Goepp, Jr., New Castle, assignor to Atlas Powder Co., Wilmington, both in Del.

2,430,933. **Laminated Product Including at Least One Lamina of a Polymeric Organic Material Having a Substantial Number of Hydrogen Atoms Attached to Elements from Groups V and VI of the Periodic Table, and, as Bonding Agent, a Composition Including a N-Alkoxymethyl Polyamide.** F. W. Hoover, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,430,949. **Polyvinyl Alcohol Composition Containing, as Plasticizer, Ethanol Formamide Stabilized by a Substance from the Group of Formic Acid, Acetic Acid, and the Formic and Acetic Acid Esters of Glycerol and Glycol.** C. A. Porter, Belleville, and R. Fershko, Newark, assignors to Resistoflex Corp., Belleville, both in N. J.

2,430,950. **Resin Modified N-Alkoxymethyl Polyamide.** H. S. Rothrock, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,430,972. **Butadiene Extraction.** N. F. Black and L. E. Pirkle, Baton Rouge, La., assignors to Standard Oil Development Co., a corporation of Del.

2,431,001. **Forming a Coating on a Fabric by Applying a Coat of a Composition Containing an Elastomer and Then Applying a Top-Coat of a Composition Containing a Chloroprene-Acrylonitrile Interpolymer, Curing, and Then Halogenating.** D. J. Sullivan, Fairfield, Conn., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,431,028. **Cyclized Rubber Composition Stabilized by a Condensation Product of a Phenol, Formaldehyde, and Morpholine.** C. M. Carson, Cuyahoga Falls, assignor to Wingfoot Corp., Akron, both in O.

2,431,056. **Gas-Impervious Fabric Including**

a Sheet of a Copolymer of Vinylidene Chloride and a Vinyl Ester Cemented to a Woven Fabric of Linear Polyamide Resin Fibers by Means of an Adhesive Including a Polymer of 70 to 100% Vinyl Chloride. O. W. Loudenslager and J. E. Wilson, assignors to Wingfoot Corp., all of Akron, O.

2,431,078. Stable, Fluid Suspension of a Toluene-Insoluble Vinyl Resin in a Liquid Including a Solvent Plasticizer for the Resin and a Mixture of Liquid Hydrocarbons. G. M. Powell, 3rd, and T. E. Mullen, both of South Charleston, W. Va., assignor to Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2,431,216. Production of 2-Vinylfuran from 2-Furanacrylic Acid. C. R. Wagner, Utica, O., assignor to Phillips Petroleum Co., a corporation of Del.

2,431,303. For a Closure for Sealing a Container for Strong Acids, a Liner Material Including a Mixture of Polyisobutylene, with Vinyl Chloride-Acetate Copolymer or Polyvinyl Chloride, an Inorganic Filler, and Synthetic Resin Fibers and Glass Fibers. B. R. Billmeyer, assignor to Armstrong Cork Co., both of Lancaster, Pa.

2,431,373. Producing a Soluble Fusible Copolymer by Heating a 15 to 30% Solution of Divinyl Benzene in a Diethyl Benzene in the Presence of a Polymerization Catalyst and a Monohydric Alcohol Diester of Itaconic Acid for a Period Less Than Required to Cause Gelation. G. F. D'Alelio, assignor to Pro-phy-lac-tic Brush Co., both of Northampton, Mass.

2,431,374. Producing a Fusible, Soluble Copolymer by Heating a Mixture of Monomers Consisting of Diallyl Maleate and a Diester in an Inert Liquid Diluent in the Presence of a Polymerization Catalyst for a Period Less Than Required to Cause Gelation. G. F. D'Alelio, assignor to Pro-phy-lac-tic Brush Co., both of Northampton, Mass.

2,431,384. Masonry Joint Sealing Composition Including Rubber, Asphalt, Petrolatum, and a Tackifier. A. C. Fischer, Chicago, Ill.

2,431,385. An Expansion Joint between Two Pavement Sections Formed of a Rubberized Bituminous Material Containing Residual Oil, and Solid Filling Material. A. C. Fischer, Chicago, Ill.

2,431,386. Water-Stop Expansion Joint for Masonry Including Rubberized Bituminous Material Consisting of Rubber-Like Hydrocarbons, Asphaltic Hydrocarbons, Hydrocarbon Oil, and Resinous Compounds. A. C. Fischer, Chicago, Ill.

2,431,403. Treatment of a Butadiene Compound at 350 to 450° C. with a Contact Mass Consisting Essentially of Fused Alumina. H. L. Johnson, Media, H. G. Voelker, Philadelphia, and A. P. Stuart, Norwood, assignors to Sun Oil Co., Philadelphia, all in Pa.

2,431,454. Preparing Low Molecular Weight Olefin Polymers from Relatively Higher Molecular Weight Olefin Polymers. H. Berk, Elizabeth, and D. W. Young, Roselle, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,431,461. In the Polymerization of Isobutylene and a Polyolefin having 4 to 10 Carbon Atoms at Temperatures between —10 and —160° C., Pretreatment with a Metal Halide to Effect Purification, and thereafter Polymerizing by the Application of a Friedel-Crafts Catalyst. J. D. Calfee, Westfield, and R. M. Thomas, Union, all in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,431,526. Process for Recovering Valuable Products from Emulsions of High Molecular Weight Isobutylene Polymers and Water. P. S. Viles, Goose Creek, Tex., assignor to Standard Oil Development Co., a corporation of Del.

2,431,554. Process for Removal of Impurities from Vinyl Acetate. V. L. Hansley, Niagara Falls, and P. L. Magill, Ransomville, both in N. Y., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Dominion of Canada

444,753. Resinous Heat Reaction Product of One to 4 Molecular Proportions of Mono-ortho-Amino-Diphenyl and an Addition Product of One to 6 Molecular Proportions of Formaldehyde with One Molecular Proportion of Melamine. Monsanto Chemical Co., St. Louis, Mo., assignee of M. J. Scott, Springfield, Mass., both in the U. S. A.

444,754. Oil- and Heat-Resistant Gasket of Inorganic Fibrous Material Carrying, as Binder, a Rubbery, Resilient Heat Conversion Product of an Organic Silicon Derivative. Montclair Research Corp., assignee of J. B. Rust, both of Montclair, and J. M. Coon, Verona, both in N. J., U. S. A.

444,866. Making an Expander for Storage Battery Plates of the Lead Acid Type from Finely Divided Natural Lignocellulose. National Lead Co., New York, N. Y., assignee of A. Stewart, Mountain Lakes, N. J., and E. Willihnganz, Baldwin, N. Y., both in the U. S. A.

444,887. Separation of Resin-Forming Aromatic Hydrocarbon from Mixtures by Solvent Extraction. United Gas Improvement Co., Philadelphia, assignee of F. J. Soday, Swarthmore, both in Pa., U. S. A.

444,888. Polymerizing Indene Substantially Free from Coumarone by Contacting with a Catalyst from the Group of Alkyl and Aryl Acid Sulfates under Temperature Conditions not Exceeding 50° C. United Gas Improvement Co., Philadelphia, Pa., assignee of F. J. Soday, Baton Rouge, La., both in the U. S. A.

444,889. Accelerator Consisting Essentially of a Pulverulent Mixture of Benzo Thiazyl Disulfide and Zinc Stearate, in Which the Zinc Stearate Is about 1-2% by Weight on the Benzo Thiazyl Disulfide. R. T. Vanderbilt Co., Inc., New York, assignee of E. B. Curtis, Yonkers, both in N. Y., U. S. A.

445,024. Alpha (Chloroethyl) Acrylonitrile. Wingfoot Corp., Akron, assignee of J. G. Lichty, Stow, both in O., U. S. A.

445,026. Flexible Film Having Excellent Resistance to the Transmission of Water Vapor Produced by Contacting a Film of the Group of Polyvinyl Chloride and a Copolymer of Vinyl Chloride and Another Polymerizable Monomer with a Solution of a Copolymer of Vinyl Chloride and Vinylidene Chloride in a Solvent in which the Film Will Swell, but not Dissolve. Wingfoot Corp., assignee of LaV. E. Cheyney, both of Akron, O.

445,092-5,093. Styrene. Dominion Tar & Chemical Co., Ltd., assignee of M. G. Sturrock and T. Lawe, all of Montreal, P. Q.

445,097. Copolymerizing Vinyl Compounds in the Presence of a Complex Catalyst Consisting Essentially of an Acid, a Peroxide, and a Ferric Salt. Dow Chemical Co., assignee of E. C. Britton and W. J. LeFevre, all of Midland, Mich., U. S. A.

445,149. Preparing Cyclohexyl Methyl Ketone from Butadiene and Methyl Vinyl Ketone. Shell Development Co., San Francisco, assignee of R. C. Morris, Berkeley, and T. W. Evans, Oakland, all in Calif., U. S. A.

445,157-158. Copolymer of Butadiene and Styrene Containing Sulphur and about 0.005-1% (Calculated as Copper) by Weight on the Copolymer of a Material of the Class of Metallic Copper and Compounds of Copper to Accelerate Vulcanization. R. T. Vanderbilt Co., Inc., New York, assignee of A. A. Somerville, Carmel, both in N. Y., U. S. A.

United Kingdom

593,021. Sulfonyl Derivatives of Melamine. American Cyanamid Co.

593,036. Modified Olefinic Polymers. J. C. Arnold (Standard Oil Development Co.).

593,072. Plastic Compositions. Distillers Co., Ltd., J. J. P. Staudinger, and H. M. Hutchinson.

593,091. Modified Polymeric Materials. Imperial Chemical Industries, Ltd.

593,097. Poly-N-Vinyl Carbazole Products. British Thomson-Houston Co., Ltd.

593,109. Nitro Olefins. Visking Corp.

593,111. Resinous Condensation Products. British Industrial Plastics, Ltd., W. Blakey, A. Brookes, and F. L. Hudson.

593,152. Synthetic Rubber of the Butadiene-Styrene Type and a Method of Coagulating a Dispersion thereof. Firestone Tire & Rubber Co.

593,240. Film Consisting Essentially of a Tetrafluoro-Ethylene Polymer. E. I. du Pont de Nemours & Co., Inc.

593,286. Copolymers Derived from Tetrafluoroethylene and Other Halogenated Ethylenes. E. I. du Pont de Nemours & Co., Inc.

593,292. Vinyl Chloride Copolymer. Carbide & Carbon Chemicals Corp.

593,372. Liquid Resinous Adhesive Compositions. British Resin Products, Ltd., L. R. Anthony, B. Frenkel, C. E. Smith, and R. W. H. Wicking.

593,445. Polyvinyl Chloride Compositions. Soc. Des. Usines Chimiques Rhone-Poulenc.

593,458. Alkyd Resin Varnishes. British Thomson-Houston Co., Ltd.

593,475. Pimelic Acid Esters and Polymers. Wingfoot Corp.

593,477. Vulcanized Furfuryl Alcohol Resins. A. D. Little, Inc.

593,515. Inorganic Molding Compositions. British Thomson-Houston Co., Ltd.

593,519. Copolymers of Dimethyl-Styrenes. American Cyanamid Co.

593,547. Composition Including Cellulose Derivatives and N-Alkoxy Methyl Polyamides. E. I. du Pont de Nemours & Co., Inc.

593,605. Copolymers Derived from Fluorinated Ethylenes and Chlorotrifluoroethylene. E. I. du Pont de Nemours & Co., Inc.

593,699. Olefinic Polymers. C. Arnold (Standard Oil Development Co.).

593,700. Cellular Zein Boards. United States Rubber Co.

593,735. Aliphatic Carboxylic Acid Esters of Lignin Material. Mead Corp.

593,743. Age Resisters for Rubber. Wingfoot Corp.

593,748. Vulcanization of Natural and Synthetic Rubber. Firestone Tire & Rubber Co.

593,788. Polymeric Materials. J. C. Cowan and W. C. Ault.

593,797. Low Temperature Polymerization Process. J. C. Arnold (Standard Oil Development Co.).

593,845. Coating Compositions. E. I. du Pont de Nemours & Co., Inc.

593,851. Acrylonitrile. Imperial Chemical Industries, Ltd., and R. T. Foster.

593,904. Protective Coating of Metal with Polyhydric Alcohol. A. J. R. Greer.

593,921. Arylaliphatic Diamines. Soc. des Usines Chimiques Rhone-Poulenc.

593,924. Granulated Aminoplast Resin Compositions. L. Smidth.

593,929. Products from Hydrolyzed Copolymers of Ethylene and Vinyl Esters. E. I. du Pont de Nemours & Co., Inc.

593,930. Products from Polymers of Vinyl Esters of Saturated Carboxylic Acids. E. I. du Pont de Nemours & Co., Inc.

593,946. Resin Dispersions. British Cellophane, Ltd.

593,977. Dyed Artificial Resins. E. W. Jackson, B. C. Westley, and J. Buckingham.

593,997. Depolymerization of Tetrafluoroethylene. E. I. du Pont de Nemours & Co., Inc.

594,001. Vinyl Resins. E. I. du Pont de Nemours & Co., Inc.

594,008. Polymerizable Compounds. J. St. L. Philpot.

594,017. Water Resistant Coated Film. Wingfoot Corp.

594,063. Process for the Removal of Noxious Metal Compounds from Rubber. De Centrale Vereeniging tot Beheer van Proefstations voor de Overjarige Cultures in Nederlandsch-Indie, and G. J. van der Bie.

594,093. Production of Compositions Containing Derivatives of Balata Resin or Gutta Percha Resin or Similar Resins. Dunlop Rubber Co., Ltd., F. A. Jones, and D. F. Twiss.

594,101. Resinous Condensation Products. Imperial Chemical Industries, Ltd., A. A. Drummond, and J. W. Dorling.

UNCLASSIFIED

United States

2,429,611. Cable Stripper. F. J. Churnell, Bloomfield, N. J., assignor to Federal Telephone & Radio Corp., New York, N. Y.

2,429,720. Anti-Skid Tire Attachment. I. B. Holtz, Ashville, Pa.

2,429,738. Anti-Skid Device. E. H. Zimmer, Wyckoff, N. J.

2,429,782. Detachable Tube Coupling. I. R. Versoy, assignor to Berger Bros. Co., both of New Haven, Conn.

2,429,889. Wire-Armored Cable Splice. J. J. Morrison, Worcester, Mass., assignor to American Steel & Wire Co. of New Jersey, a corporation of N. J.

2,430,657. Coupling. J. G. Zolleis, Philadelphia, Pa.

2,430,996. Tire Expander. W. Rush, Bonners Ferry, Idaho.

2,431,268. Quick Detachable Hose Coupling. T. McIntyre, West New York, N. J.

2,431,338. Ornamental Trim Ring for Vehicle Wheel. G. A. Lyon, Allenhurst, N. J.

2,431,363. Tire Bulge Gage. R. R. Beezley, Memphis, Tenn.

2,431,522. Hose Connection. H. Trevaskis, Solihull, assignor to Dunlop Rubber Co., Ltd., London, both in England.

Dominion of Canada

444,524. Improving the Tensile Strength of Naturally Occurring Cellulosic Fibers by Treatment with an Aqueous Solution of an Alkali-Metal Salt of Acids of "Run" Native Congo Copal Resin. Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of H. McW. Buckwalter, Detroit, Mich., U.S.A.

444,898. Tire Valve. J. Rousseau and G. Pelletier, both of St. Guy, P. Q.

445,025. Fatigue Test for Tire Cords. Wingfoot Corp., assignee of G. DeW. Mallory, both of Akron, O., U. S. A.

445,073. Tire Tool. O. V. Teegarden, Goshen, Ind., U. S. A.

United Kingdom

593,231. Apparatus to Test the Balance of Rotating Bodies. Reid & Sigrist, Ltd., and L. G. H. Cantle.

593,289. Means for Gaging and Calibrating Flexible Rubber Seals, Etc. Girling, Ltd., and J. S. Irving.

593,291. Metal Hose Clips. Hunt & Turner, Ltd., and P. E. Milleret.

593,628. Hose Coupling. The Weatherhead Co.

593,936. Apparatus for Stripping Insulation from Cables, Insulated Wires, Etc. Metropolitan-Vickers Electrical Co., Ltd., and C. M. Sayer.

MACHINERY

United States

2,429,635. **Tool for Winding Insulating Tape on to a Cable.** A. J. Maddock, assignor to Standard Telephones & Cables, Ltd., both of London, England.

2,429,715. **Tire Tread Vulcanizing Mold.** E. A. Glynn, assignor to Super Mold Corp. of California, both of Lodi, Calif.

2,429,786. **Multiple Tire Sidewall Mold.** G. E. Wright, Waco, Tex.

2,429,945. **Apparatus to Shear Strips of Plastic Material.** V. A. Rayburn, Baltimore, Md., assignor to Western Electric Co., Inc., New York, N. Y.

2,430,496. **Device for Severing a Web Containing Thermoplastic Material.** F. G. Dodge, La Vale, Md., assignor to Celanese Corp. of America, a corporation of Del.

2,430,563. **Tool for Upsetting Hollow Rivets.** R. H. Gill, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,431,048. **Mold Press.** K. B. Kilborn, assignor to Wingfoot Corp., both of Akron, O.

2,431,349. **Injection Molding Apparatus.** T. F. Stacy, assignor to French Oil Mill Machinery Co., both of Piqua, O.

2,431,473. **Rubber Calender.** W. N. Flynn, Hamden, assignor to Seamless Rubber Co., New Haven, both in Conn.

Dominion of Canda

444,827. **Apparatus for Heat Treatment of Insulating Material.** British Insulated Cables, Ltd., Lancashire, assignee of G. H. Walton, Helsby, and P. Jones, Kelsall, all in England.

444,946. **Apparatus for Continuously Heat Treating the Covering of a Wire or Cable.** British Insulated Cables, Ltd., Prescot, assignee of G. H. Walton and J. C. Quayle, both of Helsby, and P. Jones, Kelsall, all in England.

445,074. **Vulcanizing Apparatus.** J. R. Wright, Toronto, Ont.

United Kingdom

593,744. **Apparatus for the Low Temperature Polymerization of Olefins.** J. C. Arnold (Standard Oil Development Co.).

593,786. **Devices for Removing Products from Plastic-Molding or Die-Casting Machines or Other Presses.** Fox & Offord, Ltd., V. & E. Plastics, Ltd., F. J. Lupton, and M. G. Turner.

TRADE MARKS

United States

433,367. Representation of an emblem letter **"M"** and the words: **"Malmar Industries."** Rubber sheeting. M. Goldstein, Boston, Mass.

433,370. **Arlberg.** Rainwear. F. J. Dormer, New York, N. Y.

433,398. **Flash Weld.** Tube repair kits. Western States Mfg. Co., Sioux City, Iowa.

433,412. **Natalite.** Grinding wheels, rubbing bricks, and grinding blocks. National Grinding Wheel Co., Inc., North Tonawanda, N. Y.

433,413. **Natalon.** Grinding wheels, rubbing bricks, and grinding blocks. National Grinding Wheel Co., Inc., North Tonawanda, N. Y.

433,414. **Onalite.** Grinding wheels, rubbing bricks, and grinding blocks. National Grinding Wheel Co., Inc., North Tonawanda, N. Y.

433,415. **Onalon.** Grinding wheels, rubbing bricks, and grinding blocks. National Grinding Wheel Co., Inc., North Tonawanda, N. Y.

433,429. **Oconac.** Cable sheaths. Okonite-Callender Cable Co., Inc., Passaic, N. J.

433,442. **Silaneal.** Organo polysiloxanes. Dow Corning Corp., Midland, Mich.

433,452. **Tenite.** Plasticizer. Tennessee Eastman Corp., Kingsport, Tenn.

433,468. Representation of a four-sided figure containing a representation of a dog with a Scottish hat. Raincoats. Rogers Peet Co., New York, N. Y.

433,513. Representation of an oval containing a torch. Batteries and battery cables. American Oil Co., Baltimore, Md.

433,534. **Plasticlad.** Hose. M. R. White, Chester, N. Y.

433,544. **Contro.** Elastic webbing and textile fabric. Firestone Tire & Rubber Co., Akron, O.

433,551. **Permacel.** Cements. Industrial Tape Corp., New Brunswick, N. J.

433,572. **Speed-Grits.** Coated abrasives. Behr-Manning Corp., Troy, N. Y.

433,657. **Andrews Ten Tax.** Sheet packing. W. J. Andrews, doing business as Andrews Asbestos & Rubber Co., Skokie, Ill.

433,660. **Chamois-Lastic.** Elastic fabrics. Malibu Fabrics, Inc., New York, N. Y.

433,666. **Phil-Mar Original.** Plastic coated glass fabric. Phil-Mar Products Co., Cleveland, O.

433,711. Representation of two eyes with the word: **"Twinkle."** Face masks. S. Golding, New York, N. Y.

433,778. **Emulsene.** Dental preparation. Coralite Dental Products Co., Chicago, Ill.

433,779. **Suba-Seal.** Hot water bottles, William Freeman & Co., Ltd., Barnsley, England.

433,824. Representation of a label with the words: **"Heel Stay-bilizers."** Arch supports. W. Lilenfeld, Brooklyn, N. Y.

433,829. Representation of an oval containing a foot and the words: **"H. Schreiber Arch Support Specialist."** Arch supports. H. Schreiber, New York, N. Y.

433,842. **Prak-tis.** Golf and badminton balls. Jimknit Co., Inc., New York, N. Y.

433,857. **Higgins.** Plastic coating. Higgins Industries, Inc., New Orleans, La.

433,863. **Dehydrapac.** Packaging materials. Shellmar Products Co., assignor to Shellmar Products Corp., Mount Vernon, O.

433,832. Representation of a diamond with the word: **"Parko."** Rubber dressing. Park Chemical Co., Detroit, Mich.

433,887. **Air Chief.** Radios and parts thereof, batteries, automobile horns, etc. Firestone Tire & Rubber Co., Akron, O.

433,923. **Pedigree.** Dog raincoats. F. Engel, doing business as U. S. Specialties Co., New York, N. Y.

433,941. **Vylotex.** Plastic sheets, strips, blocks, etc. International Plastics, Inc., Boston, Mass.

434,047. **Duraprene.** Wires and cables. Anaconda Wire & Cable Co., New York, N. Y.

434,051. Representation of an oval containing a torch and the word: **"Amoco."** Batteries and cables. American Oil Co., Baltimore, Md.

434,114. **Supertex.** Artificial leather. Eggers Fabric Co., New York, N. Y.

434,158. **Weymolite.** Artificial leather. Weymouth Art Leather Co., South Braintree, Mass.

434,168. Representation of a diamond containing a star. Fountain pens. Eberhard Faber Pencil Co., Brooklyn, N. Y.

434,169. **E. Faber.** Rubber bands, erasers, fountain pens, etc. Eberhard Faber Pencil Co., Brooklyn, N. Y.

434,227. **Circomar.** Rubber plasticizer. Sun Oil Co., Philadelphia, Pa.

434,234. **Aktone.** Accelerator-activator. J. M. Huber Corp., Locust, N. J.

434,256. Representation of a faucet cushion. Washers and faucet cushions. J. A. Sexauer Mfg. Co., Inc., New York, N. Y.

434,266. Representation of an oval containing another oval and the words: **"Trade Builders."** Footwear. M. T. Shaw, Inc., Coldwater, Mich.

434,268. **Daytex.** Tires. Dayton Rubber Mfg. Co., Dayton, O.

434,272. Representation of a pneumatic tire on a wheel rim with the letters: **"ATSC."** Tires. Associated Tire Specialist of Chicago, Chicago, Ill.

434,299. **Vaporite.** Rubber and Synthetic plastic packings. A. W. Chesterton Co., Boston, Mass.

434,303. **Russo.** Rubber and synthetic plastic packings. A. W. Chesterton Co., Boston, Mass.

434,316. Representation of a label with the word: **"Gasgatape."** R. B. Porter, doing business as Porter Gasket & Distributing Co., Los Angeles, Calif.

434,328. **Tanpac.** Rubber and synthetic plastic packings. A. W. Chesterton Co., Boston, Mass.

434,330. **Sortilège.** Girdles. M. Vramant, Paris, France.

434,347. **Ann's Teeners.** Girdles. Anne Undies Co., New York, N. Y.

434,361. **Snapikins.** Baby pants. Goodyear Rubber Sundries, Inc., New Haven, Conn.

434,370. **Lomex.** Girdles and brassières. Lomex, Inc., New York, N. Y.

434,406. Representation of an oval divided in half and containing the words: **"Beebe Bros."** Heels and soles. Beebe Bros. Rubber Co., Nashua, N. H.

434,408. **Conference.** Footwear. B. F. Goodrich Co., New York, N. Y.

434,419. **H-T.** Tires, tubes, belts, hose, and repair patches. Gates Rubber Co., Denver, Colo.

434,424. Representation of an oval containing a torch and the word: **"Amoco."** Tires, tubes, belts, and repair patches and kits. American Oil Co., Baltimore, Md.

434,425. Representation of an oval containing a torch cut by a white strip. Tires, tubes, belts, and repair patches and kits. American Oil Co., Baltimore, Md.

434,427. **Sunaptic.** Plasticizer. Sun Oil Co., Philadelphia, Pa.

434,424. Representation of an oval containing a torch cut by a white strip. Tires, tubes, belts, and repair patches and kits. American Oil Co., Baltimore, Md.

434,445. **Gilt Edge.** Tubes and tires. Robbins Tire & Rubber Co., Inc., Tuscumbia, Ala.

434,539. **Transylin.** Plastic shower curtains, rainwear, etc. McCoy, Jones & Co., Inc., Chicago, Ill.

434,577. Representation of a fanciful geometric design above the word: **"Omni."** Synthetic resins. Omni Products Corp., New York, N. Y.

434,622. **Koylon.** Bust forms. United States Rubber Co., New York, N. Y.

Estimated Automotive Pneumaiic Casings and Tube Shipments Production, and Inventory — October and September 1947; First 10 Months, 1947,1946

	1947				1946
	October	% of Change from Preceding Months	September	First 10 Months	First 10 Months
Passenger Casings					
Shipments					
Original shipment	1,731,874		1,674,632	16,012,904	8,474,281
Replacement	5,094,044		4,917,165	44,944,162	44,777,943
Export	188,023		132,823	1,410,098	467,215
Total	7,013,941	†4.30	6,724,620	62,367,164	53,719,439
Production	7,364,743	†13.38	6,495,900	64,785,501	54,185,031
Inventory end of month	4,108,786	†10.88	3,705,594	4,108,786	2,265,435
Truck and Bus Casings					
Shipments					
Original equipment	445,967		453,260	4,606,792	3,341,119
Replacement	1,039,570		911,239	8,313,672	8,981,627
Export	139,072		156,486	1,408,656	654,612
Total	1,624,609	†6.81	1,520,985	14,329,120	12,977,358
Production	1,524,082	†7.12	1,422,751	14,997,073	13,006,546
Inventory end of month	1,404,589	-5.43	1,485,236	1,404,589	775,591
Total Automotive Casings					
Shipments					
Original equipment	2,177,841		2,127,892	20,619,696	11,815,400
Replacement	6,133,614		5,828,404	53,257,834	53,759,570
Export	327,095		289,309	2,818,754	1,121,827
Total	8,638,550	†4.77	8,245,605	76,696,284	66,696,797
Production	8,888,825	†12.25	7,918,651	79,782,574	67,191,577
Inventory end of month	5,513,375	†6.21	5,190,830	5,513,375	3,041,026
Passenger and Truck and Bus Tubes					
Shipments					
Original equipment	2,187,374		2,119,146	20,611,926	11,825,698
Replacement	5,278,095		4,930,109	41,950,766	48,036,238
Export	150,309		183,602	2,252,211	1,063,048
Total	7,615,778	†5.29	7,232,857	64,814,903	60,924,984
Production	7,619,353	†16.51	6,539,844	66,387,358	62,168,536
Inventory end of month	6,423,833	†1.33	6,339,425	6,423,833	4,105,574

NOTE: Cumulative data on this report include adjustments made in prior months.
SOURCE: The Rubber Manufacturers Association, Inc.

SUN "JOB PROVED" PRODUCTS CUT COSTS, SPEED PRODUCTION, IMPROVE QUALITY

Proof of the value of any industrial product lies in the experience that practical men have had with it. Sun products have been "Job Proved" in the lubrication of almost every type of mining, manufacturing, power and transportation equipment . . . in refrigeration and air-conditioning . . . in metal cutting, tempering and quenching . . . in the processing of textile fibers, leather, natural and synthetic rubbers . . . in the impregnation of electrical, electronic, and packaging materials of various kinds.

To help you find solutions to problems in any of these fields, Sun Oil Company offers a wide selection of "Job Proved" petroleum products, plus the experience of Sun Engineers. Their know-how and detailed product information are yours for the asking, without obligation. Telephone your local Sun office, or write Dept. RW I. . . .

SUN OIL COMPANY
Philadelphia 3, Pa.
"JOB PROVED" PETROLEUM PRODUCTS FOR INDUSTRY

SUN INDUSTRIAL OILS

SOLNUS OILS — Well-refined straight mineral oils. Stand up under hard use for long periods of time. Recommended for use in the machine tool industry, in air compressors, certain types of Diesels, etc.

SUNVIS OILS — Are in the same category as Solnus Oils with the difference that, in addition, they meet practically all paraffinic and high V.I. oil specifications.

OCNUS OILS — Low carbon-content oils, containing an additive which minimizes oxidation and gives detergency. Ideal lubricants for internal combustion engines subjected to continuous heavy loads under the most adverse operating conditions.

DYNAVIS OILS — Low pour point inhibited oils which help prevent formation of harmful corrosive and sludge-forming acids. Well-suited for engines fitted with alloy bearings and operated at high temperatures.

SUNTAC OILS — 100% petroleum products which have been treated to increase their adhesiveness. Recommended for general lubrication in all industries where sudden shocks and reversal of loads take place. These oils cling to the parts to be lubricated.

CIRCO OILS — Used for general lubrication of industrial machinery when straight mineral oils are required.

SUNISO REFRIGERATION OILS — Have extremely low pour points and long life stability characteristics. Initially neutral and resistant to formation of detrimental acids under service conditions. The most outstanding oils in the refrigerating and air-conditioning fields.

STEAM CYLINDER OILS — High flash and fire point lubricants for either saturated or superheated steam conditions and for worm gear speed reduction units.

SUN CAR JOURNAL OILS — Dark oils meeting A.A.R. Specifications. For use on railroad cars and waste-packed bearings of railroad equipment.

SUN DELAWARE OILS — Dark oils for general lubrication on older type industrial machinery.

SUNOCO WAY LUBRICANT — Has good metal-wetting and adhesive properties, ample viscosity and E.P. qualities. For use on tableways, as it eliminates chatter and scoring . . . resists corrosion.

SUN MARINE ENGINE OILS — Compounded with special emulsifying agents in order to provide adhesion to and lubrication of working parts in the presence of water. For the lubrication of bearings, eccentrics, cross-heads and various other parts of steam engines.

ROCK DRILL OIL — Heavy-duty adhesive type oil. For use in jack-hammers, stopers and drifters on heavy-duty mining operations.

SUNVIS 900 SERIES TURBINE OILS — High V.I., predominantly paraffinic oils, of uniform 0°F. pour points, containing additives to give high oxidation stability and corrosion resistance under practical operating conditions. Modern oils for turbine and hydraulic systems.

SUN INDUSTRIAL GREASES

SUN CUP GREASES — Water resistant. For grease cup and grease gun application when the service is not severe.

SUN GUN GREASES — Smooth greases made with medium viscosity oil. Stable under pressure in power guns or booster guns.

ADHESIVE PRESSURE GREASES — Won't drip or splash and are excellent lubricants for open gear applications.

SUN DARK PRESSURE-SYSTEM GREASES — For power-driven central grease lubricating systems in heavy industries. Can also be used as a "medium cup grease."

SUN MINE CAR GREASES — Available in several grades. Suitable for both anti-friction bearings and plain bearing cavity-type wheels.

SUN ROLLER BEARING GREASES — For use on electric motors and generators and other high-temperature machinery equipped with ball or roller bearings.

SUN GEAR COMPOUNDS — Black adhesive open gear compounds and wire cable greases. Recommended for open gears on metalworking power presses, mining machinery, old reduction mills, crushers, pump gears, etc.

SUN MINING MACHINE LUBRICANT — Semi-fluid. For use where a light but adhesive type grease is required. Free from separation or decomposition.

SUNOCO TRACTOR ROLLER COMPOUND — For miscellaneous parts of caterpillar or crawler-type tracks. Provides good lubrication with exceptional sealing qualities.

SUN METALWORKING OILS

SUNICUT — Straight or non-emulsifiable transparent cutting oils. Recommended for automatic screw machines and for heavy-duty machining operations.

SUN INDUSTRIAL

SUNOCO EMULSIFYING CUTTING OIL—A self-emulsifying oil which produces a stable white emulsion when mixed with water. Sunoco is an efficient and economical cooling and lubricating medium for turning, milling, drilling, and other metalworking operations on both ferrous and non-ferrous metals. It is also an excellent grinding coolant.

SUN QUENCHING OILS—Specially refined oils designed to develop maximum physical properties in a wide variety of steels.

SUN TEMPERING OILS—Specially refined oils for tempering steel up to 550°F. Due to their low carbon content and stability under heat, these oils have an unusually long service life.

SUN ROLLING OILS—Straight and emulsifying oils which will permit maximum production in rolling steel, aluminum and brass.

SUN ANTI-RUST COMPOUNDS — Petroleum base oils with chemical additives designed to prevent the rusting and corrosion of steel.

SUN PROCESSING OILS

SUNOTEX TEXTILE OILS—Designed to impart certain additional properties to various forms of fibers during their processing from the fiber state into a manufactured product. All Sunotex textile oils are emulsifiable in water.

SUN COTTON CONDITIONING OILS—Pale mineral oils which condition the cotton. They prevent waste by cutting down excessive amounts of "fly" or fine air-borne particles of lint.

SUN ASBESTOS FIBER CONDITIONING OIL—Used for spraying on the asbestos during processing. Fibers are not so readily damaged or broken down into harmful dust when this product is used.

SUN CORDAGE OILS—Are adaptable in various formulae used by cordage manufacturers. They are selected products which are highly compatible with additives.

CIRCOSOL—2XH (Rubber Processing)—An elasticator and processing aid for GR-S particularly.

CIRCO LIGHT PROCESS OIL (Rubber Processing)—A processing aid and excellent softener for natural rubber, natural rubber reclaims, and neoprene synthetic rubber particularly. Used for GR-S to some extent.

SUNDEX 53 (Rubber Processing)—An inexpensive product suitable for processing GR-S and blends of GR-S and natural rubber. An established outstanding processing aid for footwear rubber stocks.

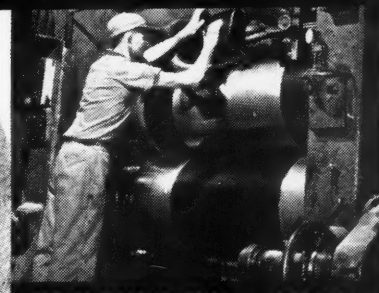
CIRCOMAR-5AA (Rubber Processing)—A black colored product used in reclaiming natural rubber scrap. Used also as substitute for asphalt fluxes in processing natural and GR-S rubber. Free-flowing at room temperature.

SUN LEATHER OILS—Mineral base leather oils. Used for obtaining the desired tensile strength, proper temper and a controlled moisture content. They maintain a light even color . . . mix well . . . distribute evenly.

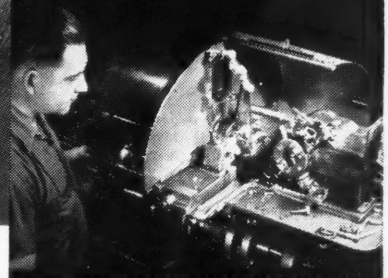
SUN MISCELLANEOUS INDUSTRIAL PRODUCTS

SUN SPIRITS — For the thinning of paints, varnishes, and enamels. Also for metal cleaning. This product is a pure water-white petroleum solvent and is free of corrosive sulphur.

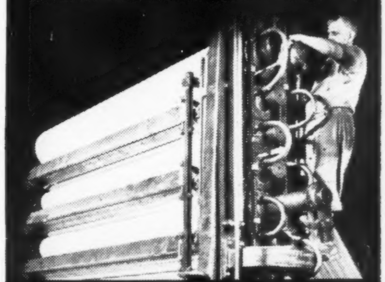
SUN WAXES — Used in packaging, sealing, coating, waterproofing and for numerous manufacturing and chemical processes.



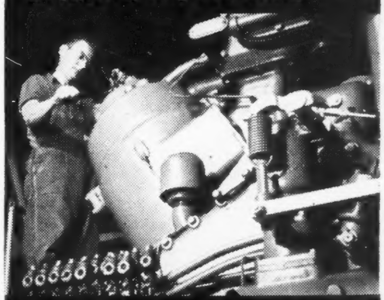
RUBBER MANUFACTURER saved $3,000 a year with a Sun Processing Aid.



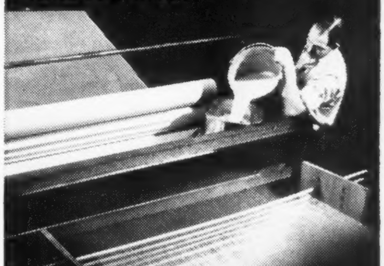
ALUMINUM PARTS MANUFACTURER increased output 43% with Sun Cutting Oil.



PAPER MILL slashed annual lubrication bill $2,874 by using a Sun Grease.



POWER PLANT found Sun Diesel Lubricant lasted 50% longer.



A TEXTILE MILL increased slashing speed 60% by adopting a Sun Processing Oil.

PRODUCTS

SUNOCO

New Machines and Appliances

"Precision" Rugosimeter for Measuring Surface Roughness

Surface Roughness Tester

A NEW instrument designed for measuring the rugosity or surface roughness of calendered raw rubber sheet or similar material is being manufactured by Precision Scientific Co., 3737 W. Cortland St., Chicago, Ill. The measurement made is essentially the resistance to flow of air between the rough surface and an annular test plate which rests upon the surface being tested.

The apparatus consists essentially of the following elements in series; a constant pressure air valve; a large needle valve with a calibrated scale; a manometer; and an annular test plate. The needle valve is opened to the point at which the pressure on the monometer is one-half the pressure maintained by the constant-pressure valve. The resistance of the needle valve to the air flow is then equal to and measures the resistance of the test plate on the sample.

Beth-Tec Heat Unit

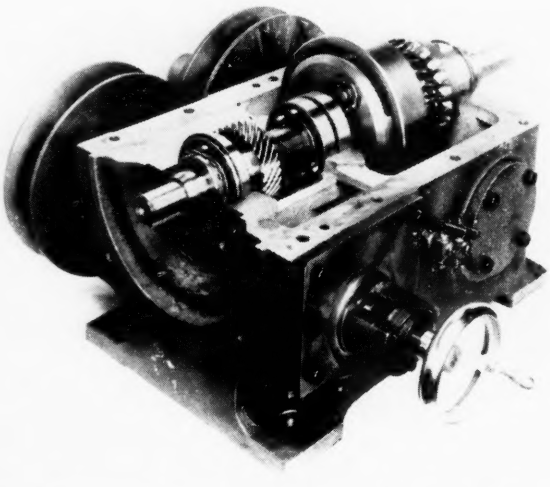
The Beth-Tec Heat Unit

A NEW completely self-contained unit for supplying and controlling heat in the temperature range between 350 and 1000° F. has been announced by the Bethlehem Foundry & Machine Co. The Beth-Tec unit now offers production engineers in all industries where accurate control of heat at high temperatures is required the opportunity to put heat processing on a more efficient basis. The new unit bridges the gap of precision control of heat in the range between steam and direct fire and eliminates high working pressures and costly equipment. "High-Tec" heat transfer salt, a high temperature salt formulated by E. I. du Pont de Nemours & Co., Inc., is used as the heat transfer fluid. "High-Tec" is a stable, non-corrosive, eutectic mixture of inorganic salts that has negligible vapor pressure over the 300 to 1000° F. range.

The Beth-Tec unit consists of a complete furnace comprising the boiler proper, complete with tubes, headers, and manifolds and a highly efficient, proportioning type of oil burner and blower designed to supply ample air for combustion. A sump tank contains either a steam-heating coil or an electric immersion heater for melting the salt mixture for initial operations. In addition there is a submerged salt pump for starting and continuing the flow of salt. Atop the boiler are two salt control valves which are of the air-operated diaphragm type. These have especially designed stuffing boxes and are completely jacketed for steam heating.

Separate from the unit itself is the instrument and control panel. This is complete with all necessary instrumentation and safety controls to provide "fail-safe" operation under all conditions. Interconnecting wiring between the control panel and the boiler unit proper is supplied and provided for by duct-type cables.

Units are available from 500,000 B.T.U.'s an hour to 2,500,000 B.T.U.'s an hour in continuous operation at 650° F., operating at an approximate overall efficiency of 50%. The Beth-Tec unit should be outstandingly useful for catalyst temperature control in chemical processing and in any other operations where high-temperature accurately controlled heat is required.



Speed Reducer with Upper Housing Removed to Show Gearing

Lombard Variable Speed Reducer

THE new variable speed reducer made by the Lombard Governor Corp. is a wide-range transmission unit particularly suited to those installations where the ratio of maximum to minimum output speeds is large. With a constant speed motor, the machine output speed is continuously adjustable. Useful speed range of greater than 20:1 is obtained with a minimum speed of approximately zero.

The unit has a compact design only slightly larger than the driving motor. In the smaller sizes it is available with a flange-mounted motor which meets smaller space requirements. Power is transmitted through the gearing in a straight line, with a planetary speed reducing unit installed between the input and output shafts.

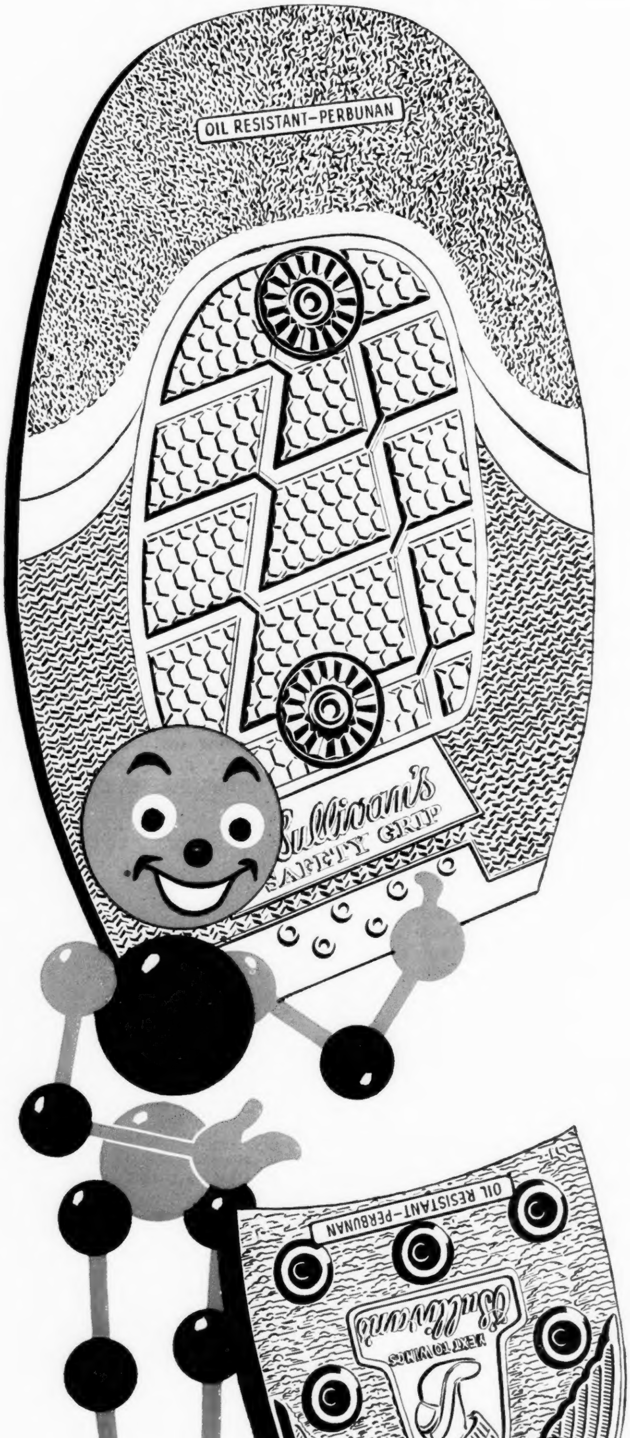
Gears are of heat-treated helically cut alloy steel with special cast-bronze worm and ring gears. Planet gears of the speed reducer unit are mounted in a one-piece hardened alloy steel cage which is combined with the output shaft. This construction provides a high degree of rigidity and assures perfect alinement of the gearing. All gearing is totally enclosed and immersed in oil.

A simple hand-wheel mechanism with a large easily read speed indicator dial adjusts the output speed of the unit. Distant control can also be furnished together with built-in limit switches. The unit is available in sizes ranging from two to 15 h.p. Further information on the speed reducer is given in the company's bulletin, VRS-23-15.

O'Sullivan

"America's No. 1 Heel and Sole" selects

PERBUNAN



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BECAUSE ***"We tried every oil resistant material available and we found Perbunan could be finished to the right degree of hardness and still have sufficient high and low temperature flex resistance in presence of oil" . . . writes J. M. Mason, Vice President, O'Sullivan Rubber Corporation.***

BECAUSE with this new O'Sullivan line, working shoes can now have heels and soles that gasoline and oil *cannot penetrate*—as happens with leather.

BECAUSE Perbunan Nitrile Rubber will not deteriorate or swell after contact with gasoline or oil—as happens with natural rubber.

BECAUSE Perbunan heels and soles keep their safety-grip qualities *longer* than natural rubber.

IF YOU have problems that could be solved by a rubber that not only resists oil, weather extremes, abrasions and wear . . . but also *holds* delicate colors—write our nearest office!

PERBUNAN
REG. U. S. PAT. OFF.

THE RUBBER THAT RESISTS OIL, COLD, HEAT AND TIME

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.; First National Tower, 106 South Main Street, Akron 8, Ohio; 221 North La Salle St., Chicago 1, Illinois; 378 Stuart Street, Boston, 17, Massachusetts. West Coast Representatives: H. M. Royal Inc., 4814 Loma Vista Avenue, Los Angeles 11, California. Warehouse stocks in Elizabeth, New Jersey; Los Angeles, California; Chicago, Illinois; Akron, Ohio; and Baton Rouge, La.

EUROPE

GREAT BRITAIN

Programs of IRI Sections

The programs of meetings and lectures to be held by the various sections of the Institution of the Rubber Industry during the 1947-48 season, as far as they have been completed, include:

London Section: October 21. "Vulcanization" by G. F. Bloomfield.

November 18. "Industrial Design."

January 20, 1948. "Hysteresis." L. Mullins.

February 17. Latex Symposium: "Creamed Latex," H. C. Baker; "Centrifuged and Electrodepositioned Latex," E. A. Murphy; "Evaporated Latex."

March 16. Engineering paper by J. W. W. Dyer.

Manchester Section: September 22. "Reminiscences of 30 Years' Experience in Rubber and Cable Manufacture," H. C. Harrison.

October 27. "Incidentals in Latex Treatment," B. Gordon Darnton.

November 24. J. H. Carrington, on his recent visit to the the United States.

December 15. "The Technology of Some New Condensation Rubbers," D. A. Harper.

January 26, 1948. "Polymer Progress," N. J. L. Megson and G. L. Hammond.

February 23 "Machinery and Layout in German Rubber Plants," L. A. Oliver.

Midland Section: September 29. "Chromatic Interlude," F. H. Cotton.

October 13. "Newer Developments in Carbon Black," D. Parkinson.

November 10. "What the Vehicle Operator Wants from the Tire Industry," S. C. Vince.

December 8. "Recent Advances in Synthetic Rubber," E. R. Rowzee and R. Hatsch.

January 12, 1948. "Man-Made Fibers in Tire Casings," J. W. Illingworth.

February 9. Symposium: "Color in the Rubber Industry"; "Physics and Measurement of Color," M. D. Gauntlett; "Technology of Color," J. Haworth; "Use and Abuse of Color," T. H. Gray.

March 8. Rubber Adhesives, L. E. Puddefoot.

Leicester Section: October 17. "What Is Costing?" E. A. Duke.

November 6 and 24 and December 3. Discussion groups dealing with crude rubber and vulcanization, compounding and testing.

January 9, 1948. "Libraries and the Handling of Technical Information in the Rubber Industry," G. A. Shires.

January 29, February 28, and March 26. Discussion groups dealing with various aspects of compounding and testing.

April 16. Annual general meeting followed by "The Past, Present and Future of Rubber," by H. J. Stern.

Preston Section: October 13. "Safe Handling of Blacks," H. Willshaw.

December 10. "The Nature and Reason for Ingredients in Rubber Mixings," H. Jackson.

February 9, 1948. "Training within Industry," Mr. Percival.

Australasian Section: *Victoria Branch*: September 24. "Salesmanship *versus* Scientific Distribution," S. C. Nielson.

November 26. "Administration and Financial Control—Their Value to the Industry," H. Wittig.

New South Wales Branch: September 11. Annual general meeting of the Australasian Section followed by "High Frequency Heating in the Rubber Industry," by a speaker from Standard Telephones.

Secretariat of the Rubber Study Group in London

A permanent Secretariat of the Rubber Study Group has now been established in London by governments interested as producers or consumers in natural rubber. The following countries have so far accepted membership: Canada, Ceylon, Czechoslovakia, Denmark, France, Hungary, Liberia, the Netherlands, United Kingdom and the British Colonies, and the United States.

As agreed at the Study Group meeting in Paris last July, the new Secretariat has taken over the staff and offices of the London Rubber Secretariat at Brettenham House, Lancaster Place, W., C. 2.

The functions of the new Secretariat will include: (1) providing the Study Group with full information service covering both the statistical situation and the general economic position as it relates to rubber; (2) providing the necessary link between the member governments in correspondence between meetings of the Group; (3) making necessary preparations in connection with meetings of the Group; (4) maintaining liaison with the other international organizations whose work is especially of interest to the work of the Group; (5) making such studies as the Group itself may direct; (6) issuing the *Rubber Statistical Bulletin* which had been formerly issued by the London Rubber Secretariat.

Linatex Pump and Ball Mill

Linatex products, practically unobtainable during the war because of the heavy demand from the Services for the material for use in self-sealing fuel tanks and fuel pipe systems have again appeared on the market.

At the recently held Engineering and Marine Exhibition new applications of Linatex were featured—a Linatex pump and Linatex ball mill. The Linaetx pump, developed by the South African Linatex organization and used in the Rand mines, is primarily a sand pump. It has proved so successful that large-scale development was undertaken in England at the company's factory at Cumberley. The pump is so designed that metal is nowhere exposed to abrasive wear. A shrouded type of impeller is used having vanes (two or four, depending on the size of the machine) made of solid Linatex rubber. The impeller design is said to be so well suited to its purpose that even under conditions where other types of impellers have had to be replaced after a few weeks' use, the Linatex impeller continued to give service for years.

The Linatex ball mill, especially designed for small or laboratory use, consists of Linatex rings compressed together and retained by tie-rods embedded in the rubber itself. It is claimed that metallic contamination of the contents of the mill is impossible and that most of the noise usual with all mills is eliminated.

Other Linatex goods shown were tank, chute, and pipe linings and air conditioning accessories; in addition the company exhibited extrusions, moldings, and molded products made from Novatex, a new rubber-like oil-resisting material produced in the company's plastics division.

British Business Notes

Balata, Ltd., has moved from 155 Fenchurch St., to Market Buildings, 29 Mincing Lane, London, E.C. 3. The telephone number and the telegraphic address remain the same.

Thurgar Bolle (Successors), Ltd., has just been formed to acquire and amalgamate Thurgar Bolle, Ltd., H. D. Thurgar, Ltd., and Injectaplastic, Ltd., to manufacture and deal in casein, celluloid, cellulose acetate, ebonite, paper substitutes, pigments, plastics, resins, etc., and goods made therefrom. The company has a capital of £125,000 in 5s. shares. The directors are H. D. Thurgar, director of H. D. Thurgar, Ltd.; G. J. E. Bolle, Oyonnaux (Ain) France, director of Thurgar Bolle, Ltd.; and R. C. Thurgar director of H. D. Thurgar, Ltd.

British industry is now spending about £30,000,000 a year on industrial scientific research, carried out by a staff of about 45,000, which include in the neighborhood of 10,000 qualified scientists and engineers, a survey by the Federation of British Industries Industrial Research Secretariat reveals. It is added that British Industry had planned to increase its research staff by 25% in the period January, 1946, to December 1947, but this increase has largely been prevented by the shortage of scientific manpower.

The new Control of Engagement Order which requires emtary G. S. Cook, has moved to Market Bldgs., Mark Lane, London, E.C.3.

The new Control of Engagement Order which requires employers to obtain labor and employes to get positions solely through labor exchanges or approved employment agencies, so as to direct workers to jobs on essential work, is on the whole welcomed by the rubber industry. In view of the important role assigned to it in the recently launched export drive, with a target four times its prewar figures, the rubber industry may be presumed to be among the essential industries, and therefore among those having some priority of labor. The Scottish branch of the industry, in particular, which has been severely handicapped by an acute shortage of female labor, hopes that the new direction of labor will tend to improve its situation in this respect.

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FRANCE

The French Foam Rubber Industry

Foam rubber which, unlike sponge rubber, consists of individual closed, non-communicating cells, was developed as a result of experiments by two Germans, the Pfleumer brothers, who had been testing the effect of injecting inert gas in pasty masses. In 1910 they patented a process in which nitrogen was injected into a pasty mass of rubber under pressure, and the whole vulcanized at 140° C., before releasing the gas pressure. In the following year they obtained French and English patents. The new process seems immediately to have attracted attention in France where a company was formed which in 1913 obtained a license to exploit the Pfleumer patents. Before the new undertaking could get under way, the first world war intervened and it was not until 1919 that activities in the planned direction could be resumed. However it took the Société Franco-Belge du Caoutchouc Mousse, which acquired the factory some years later, to make real progress in this new field. In the 1930's the rubber division of Etablissements Luchaire started a factory to exploit processes of the British Expanded Rubber Co., which were also based in the Pfleumer patents.

In a recently published article[2] G. Colin discusses the preparation of foam rubber and its uses in France. Here roughly shaped sheets of the desired compound are wound on to a reel, end to end, together with a band of high-resistance steel of the same width as that of the rubber, with paper between the rubber and metal band, while the whole is firmly bound. The metal band serves to maintain the initial volume of the rubber against its tendency to expand under the pressure of the gas introduced, while the paper confers a certain elasticity to the assembly, permitting a slight dilatation of the rubber at the end of the operation of introducing the nitrogen into the rubber. Several of the firmly strapped reels are placed, one next to the other, into high-pressure autoclaves, which may be either horizontal or vertical. In French factories the most usual type is a horizontal cylinder about 280 millimeters in diameter, with a breech-block type of closure. Some of the vertical autoclaves have a diameter of 660 millimeters with a length of four meters, and the reels are stacked in from the top by means of traveling cranes.

In the course of introducing the nitrogen, the rubber is first subjected to pressure of the cold gas, and then steam is let into the jacket of the apparatus whereby the temperature is progressively raised to that requisite for prevulcanization, and the pressure is increased to 500-650 kilograms. The preliminary vulcanization toughens the cells so that they can resist expansion without bursting. Rapid cooling by the circulation of cold water terminates this phase of the process. The reels are then removed from the apparatus and disassembled, freeing the sheets which, under the influence of the occluded gas begin to dilate somewhat in the ambient temperature.

Next comes the expansion of the rubber which takes place in molds arranged either between the heating plates of a press or in autoclaves or stoves. The heat causes the occluded gas to expand and fill all the available space, and the rubber at the same time receives its final cure. Before the foam rubber thus obtained can be worked up into finished articles, it must be allowed to rest for some time to permit excess nitrogen to diffuse by osmosis. The foam rubber is made either soft or hard. The material has a density usually running from 0.06 to 0.10, as compared with 0.24 for the best quality cork; however certain grades of foam rubber have a density of 0.25 and even of 0.40.

The remarkable tightness of hard and soft foam rubber, greater than that of any other material of equal density, makes it ideal for nautical purposes, especially for all kinds of floats. Because of the inertness of the enclosed nitrogen, foam rubber is also remarkably unaffected by moisture or bacteria. At equal weight and volume, foam rubber is also superior to all other materials in respect of thermal isolation, especially at low temperatures. Thus dry ice transported at the critical temperature of —80° C. in ebonite foam containers showed a loss in weight of less than 0.5% in 24 hours, while the temperature of the external atmosphere was +20° C.

Foam rubber is also a first-class electrical insulator. In view of its extensive use on warships the problem of fireproofing required special attention and has now been solved for both the soft and hard forms.

Finally unusual mechanical properties have been observed in ebonite foam bonded sandwich fashion between two thin sheets of metal. According to tests with the Amsler machine, the effort necessary to buckle a sheet of this type corresponds to that of 41 kilogram per square millimeter, exercised on the section of a sheet of the same metal having the same area and the same weight as the sample of foam rubber sandwich.

Besides numerous use for foam rubber for surgical, hygienic, industrial, and household purposes, may be mentioned its utilization in safety belts, life buoys, unsinkable fittings, and floats for various purposes. Ebonite foam has proved its value before and during the war as a protection for badly damaged warships.

A relatively new development has been that of splitting plates of foam rubber to get sheets one millimeter to 1.5 millimeter thick. Special apparatus and skill are required for this operation, and various new uses are expected for the material thus obtained. For instance, it has been suggested that split foam rubber could be used for lining certain types of garments which would thus combine warmth and resistance to moisture with great lightness.

Armored ebonite foam is being used increasingly in the construction of airplanes. Soc. Nationale de Construction Aeronautique du Sud-Est has used this material for the flooring of the cabins of certain of its newest commercial planes, with consequent considerable reduction in weight. So satisfactory have results been that the company now plans to install this material in a new model of a stratosphere plane where it will not only form the flooring, but also the bulkheads of the airtight cabins.

Measuring Moldability of Rubber Compounds

The 1946 first prize for applied research awarded by the Institut du Caoutchouc went to Paul H. Mensier for his investigations on the molding of rubber, a summary of which appears in a recent issue of *Revue Générale du Caoutchouc*.[1] In it the author describes a method of expressing what he terms the "aptitude for molding" (or, as we shall call it, moldability) of rubber compounds, in figures directly measurable on a test piece. This is achieved with the aid of a simple apparatus consisting of a hollow cylinder, the base of which is held in place on a cover by set screws in such a way that the base and the cover form a mold, and a second cylinder, which has a circular-section channel, and moves inside the first cylinder, acting as a piston. To carry out a test, a disk of uncured rubber compound with a circular section exactly equal to that of the interior of the hollow cylinder is placed in the mold space. The piston is then introduced into the cylinder so that it rests on the sample, and the apparatus is next placed vertically in a small laboratory autoclave, for vulcanization. The weight of the piston causes the rubber to move into the channel while it is still plastic so that at the end of the operation a vulcanized sample is obtained which has a kind of stem in its center. The moldability of the sample is determined by measuring the height of this stem.

The disk of rubber should be thick enough so that the volume of the stem is relatively small as compared with the volume of the sample, and it should be perfectly free from air bubbles. At least three tests should be made for a given compound. Maximum variation of the average of results for the same mix is said to be about 7.7%, which is considered satisfactory for rubber.

The test was first applied to mixes compounded respectively with the accelerators D.P.G., M.B.T., and disulfide of tetramethylthiuram, when it was found that the moldability of the first mix was inferior to that of the second and only slightly superior to that of the third. The difference in moldability of the first two mixes might be explained by the fact that the second accelerator has an inherent plasticizing effect on rubber, but why the difference in the action of the third, as compared with the first accelerator, was not more adequately reflected in the results remained a puzzle until the proportion of the sulfur in the various mixes was also considered as a factor. Further tests clearly proved that sulfur has the same effect on a mix as an anti-plasticizer; also that there is a definite optimum of moldability; these findings led to the formulation of the following rule: For definite conditions of cure there is a proportion of accelerator and, hence, a proportion of sulfur for which the moldability of a mix is at a maximum.

Several of the most generally used fillers (carbon black, chalk, magnesium carbonate, zinc oxide, barium sulfate, kaolin, talcum, lithopone, and P-33 black) were next tested for their effect on the moldability of mixes in which they constituted from 5% to 20% of the total volume.

Barium sulfate, it was shown, hardly affected moldability, even when up to 20% was used; while carbon black caused the greatest decrease in this property. However, when only 5% by volume of the filler was added, carbon black caused a smaller reduction in moldability than lithopone, talc, zinc oxide, or magnesium carbonate. The results also plainly showed up the difference in the properties of P-33 black and carbon black; but, it is to be

[1] Sept., 1947, p. 320.
[2] *Rev. gén. caoutchouc*, Sept., 1947, p. 307.

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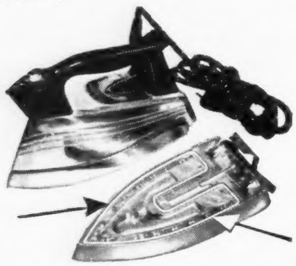
Silicone News

DC SILICONES

Silastic* Seals Steam Iron

In devices as varied as aircraft engines and steam irons, Silastic is proving its usefulness as a gasketing material. The reasons are obvious enough—if you know Silastic. These silicone rubbers are the only rubbery materials that stay elastic on continuous exposure to temperatures ranging from −70° to 400° F., and that have maximum weather resistance and minimum compression set at high temperatures.



A Silastic gasket seals the steam chamber of the "Monitor" steam iron, made by Parts Manufacturing Company, division of F. L. Jacobs Co. This iron reaches its operating temperature of 500° F. in three minutes.

In the case of the "Monitor" steam iron shown above, the design engineer listed the properties required to give him a satisfactory gasket to seal the sole plate to the sole plate cover. His list read as follows: Wanted, a material which is

insoluble in water
stable up to 500° F.
stainless and odorless
permanently pliable and elastic

He tested many materials trying to find that combination of properties. None of them would work. Several months later he got a sample of Silastic 125. It met his needs so exactly that it seemed made to order. The initial cost per iron was very low and life proved to be long. None of these gaskets have failed in two years.

In addition to gasketing applications, Silastic is being used more and more extensively as an electrical insulating material and as calking and potting compounds. The properties of the various Silastic stocks are described in pamphlet No. U 21-2.

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noted that high P-33 black content also led to a very considerable decrease in moldability.

Next the effect of fatty acids and plasticizers was observed. The most active plasticizers proved to be pine tar, vaseline oil, and petroleum; the least active, mineral rubber, vaseline, and spirits of turpentine.

The author points out that his test clearly demonstrates that the property which he calls "*aptitude au moulage*" cannot be connected in an absolute fashion with any other property of compounds and must be made the object of direct investigation.

In conclusion he adds that these studies have proved useful in connection with preservation of unvulcanized mixes. Such mixes, he recalls, frequently begin to vulcanize spontaneously by the time they are used without showing visible difference in plasticity on reheating, although actually their moldability has been greatly reduced. But changes of this kind can be easily detected by his method.

Chevalier Andre Bergougnan—Patriot

The outside world is only just learning of the ardent patriotism of a well-known rubber manufacturer, Andre Bergougnan, head of the tire and rubber manufacturing concern, Etablissements Bergougnan, Clermont-Ferrand, whom the French Government has been pleased to honor with a knighthood. From the citation accompanying the announcement of this distinction we learn that from 1940 on, M. Bergougnan firmly resisted all the exactions by Vichy in favor of the German authorities. During the entire period of the occupation he systematically curbed and delayed deliveries intended for the enemy and at the same time, in spite of the risks involved, supplied a considerable amount of equipment to the resistance movement, assured the camouflage of a batallion of infantry, vigorously refusing to declare it to the Vichy authorities despite orders to do so. He was, besides, at the head of a vast, organization of secret transportation. Thanks to his bold initiative, he was in a position at the time of the liberation to place at the disposal of the French Forces a considerable amount of war materiel made in his factories and withheld from the enemy. During the underground struggle against the enemy he gave the purest evidence of ardent patriotism.

NETHERLANDS

Report on Rubber Foundation

The annual report of the Rubber Foundation for 1946, which has just come to hand, gives details regarding the staff, the activities of the departments of research, patents and consumption development, and future plans.

The Plastics Institute has finally been separated from the Rubber Foundation and is now known as the Plastics Institute T. N. O. A new director of the Institute has been appointed, but Dr. Houwink, the former head, has been given a seat on

FOR HIGH ABRASION FURNACE USE PHILBLACK O
FOR FURTHER DETAILS, SEE AD ON PAGE 436

the managing board and will continue to maintain contact with the organization.

For the first time since the end of the war the work of the research departments could be continued without interruption, although lack of suitable personnel hampered efforts, especially in the technological research department. This department, incidentally, is one of the two sub-divisions into which it has been decided to separate the research department; the other is the chemico-physical department.

In 1946 the work of the latter department included investigations in connection with the modification of the rubber molecule and on the chemistry of derivatives. Whereas efforts during the war had largely centered on the production of elastic rubber derivatives with special properties, as oil-resistance, now attention was directed to non-elastic derivatives, and a comprehensive study was made of the chlorination of rubber, reaction of hydrochloric acid with rubber, and the reactions of a number of unsaturated compounds with crude rubber. Investigations were conducted on the stability of the products obtained, and simple methods devised for determination of this property. By the end of the year some promising results were achieved.

The investigations by Dr. van Amerongen on polymerization and the obtaining of satisfactory yields of isoprene from crude rubber or from latex by breaking down at high temperatures were discontinued about the middle of the year, as were the investigations on the derivatives of isoprene by Dr. Ultee. The findings of Dr. Ultee concerning the derivatives obtained and their properties are to be published. Research on polymerization and copolymerization in connection with the preparation of modified rubbers was for the most part stopped.

The resignation of Dr. Wildschut, who for years had guided the physical investigations slowed up work here for a time. The investigations included the measurements of the temperature coefficient of elastic tension, at lower temperatures especially. It was found that natural rubber and neoprene in many cases show a second transition point at temperatures between —5° and —20° C., below which there is little or no increase in crystallization. Rubber-resin vulcanizates also showed a second transition point.

With regard to relaxation phenomena, it developed that when a relaxed vulcanizate (the so-called A mixture) is further stretched without being released, it has a greater tensile strength than when it is first released and then stretched.

In studies on the rate of retraction of natural and synthetic rubber vulcanizates, the experimentally determined resilience curves in some cases were found to yield shorter resilience periods than did the theoretical calculations by Dr. Wildschut's formula. It was also observed that the total resilience period for the synthetic rubbers tested was definitely greater than for natural rubber.

There was a temporary slowdown in X-ray investigations after Dr. Goppel resigned. Mr. Arlman continued this work, especially that devoted to improvements in technique developed by Dr. Goppel for the quantitative determination of crystalline rubber in stretched vulcanizates. Mr. Arlman also studied the connection between the differences in the stress-strain diagram in successive cycles of strain and crystallization phenomena. In the course of this work it became evident that the operations of stretching and taking of the X-ray picture would have to be combined instead of being carried out separately as Dr. Goppel had done, and new and costly apparatus is being designed for this purpose.

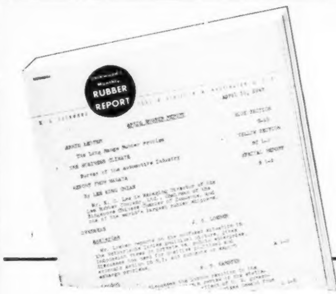
Mr. Arlman also made X-ray investigation of the complex compound dicyclopentadiene silver nitrate in a molar ratio of 1:1, a similar compound of natural rubber with silver nitrate.

In the technological department preparations were made for carrying out investigations on the applications of latex and methods of bonding rubber to metal.

The department for development of consumption (formerly technico-commercial department) again began to direct its attention to rubber in roads and in agriculture.

SPAIN

Spain's chemical industry has shown marked growth in recent years, and activity is at a high rate despite the lack of certain raw materials. Interest in synthetic resins and plastics is also becoming even keener. A report from Europe states that the Spanish firm, S. A Standard Electrica, plans a department to manufacture plastics for covering wires and other electrical parts; while a second firm, Empresa Imporex, S.A., Madrid, will shortly begin the production of bakelite for electrical parts.



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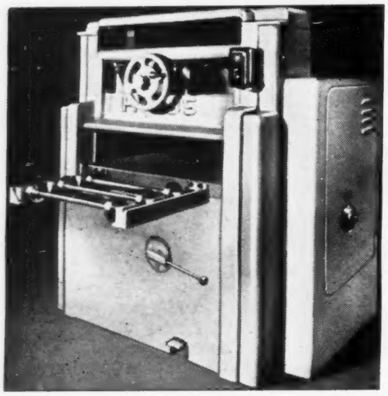

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Editor's Book Table

BOOK REVIEWS

"Technological and Physical Investigations of Natural and Synthetic Rubbers." A. J. Wildschut. Elsevier Publishing Co., Inc., New York, N. Y. Cardboard, 6 by 8⅜ inches. 173 pages. Price $3.

This monograph was prepared during the war to give a picture of the status and the progress of investigations in the field of rubber and rubber-like materials in the Netherlands during that period. It serves this purpose admirably. It will be of greatest interest for research workers concerned with a basic understanding of the properties of rubber-like materials and the relationship of these properties to molecular structure.

The scope of the book and the material presented are sufficiently important that one might wish that the book would be authoritative. The isolation imposed by the war on the Netherlands precluded this quality. It is essential that the reader have a background of recent technical literature to appreciate the significance of the research reported and to orient it properly in the light of concurrent advances in knowledge which were being made elsewhere.

The first sections of the book deal with a technological comparison of different types of synthetic rubbers and natural rubber using simple gum stock and tread stock formulations. Butyl rubber was apparently not available for inclusion in this study. A brief description is given of the various testing procedures used, and the results of the tests are tabulated and discussed. The flex life of Buna S was found to be superior to that of *Hevea* rubber by a factor of about 10 in the crack intiation type of flex test employed. The importance of a crack growth test does not seem to have been realized. The comparison of the various types of rubber includes the results of aging tests under a variety of conditions. Values for electrical properties, thermal conductivity, specific heat, and gas permeability are also tabulated.

One chapter is devoted to the vulcanization of rubber by means of synthetic resins, a subject which is presented as a new, attractive field for research with possibilities of many practical applications.

The second half of the book treats of methods and results of physical research investigations. It includes a broad program of work to correlate structure with physical properties, particularly the investigation of typically rubber-like behavior and the investigation of the relation between structure and tensile strength. Extensive results are reported on thermodynamic studies of rubber in tension. A new thermodynamic method for the determination of crystallinity would be more acceptable if it had been checked by X-ray examination of the test piece at various stages of the procedure.

Creep or flow tests on rubber in tension were carried out to study plastic aspects of vulcanized rubber. A quantity called the "rate of flow," the slope of the elongation-log time plot, is advanced to designate the flow. The tests did not extend over longer periods of time than 100 hours. Curvature usually develops in such plots if the flow observations are continued. The results are valuable as a study of creep or flow in the initial stages and of the effect of elongation and crystallization upon flow.

A modification of Kosten's method for determining the dynamic properties for rubbers in vibration is discussed. The description of the experimental procedure is not complete. Confusion will arise in the mind of anyone not familiar with Kosten's work between the phase angle which is measured and the angle of loss which is used to characterize the imperfect elasticity of the rubber. These are not the same. The angle of loss depends upon the ratio of the internal friction to the dynamic modulus. Although the method as described may be rapid and convenient, for many purposes it is advantageous to know these quantities separately.

The author belittles the effect of crystallinity for the development of high tensile strength and belabors this point consistently even to citing as evidence the high tensile strength of a plasticized Perbunan stock measured at the temperature of liquid hydrogen. This will probably not be so convincing as any experiences which readers may have in regard to tensile strength of rubbers which crystallize upon stretching as compared with those which do not.

The X-ray investigations of Goppel are discussed in some detail, but no explanation appears for the low values found for crystallinity in stretched rubber as compared to previous

results of Field. It seems that a linear relationship was assumed by Goppell between the diffracted X-ray intensity and the crystalline or amorphous component respectively. Field, on the other hand, determined a calibration curve which departed somewhat from linearity, but hardly enough to account for the large discrepancy in the results. Another point of difference in the procedures, the refinement by Goppel of taking into account the shape of the diffraction spots, likewise seems to be inadequate as an explanation.

It may appear that the reviewer considers the contents of the book as rather fragmentary and disconnected. Actually, it is well organized and arranged around definite objectives toward understanding rubber-like materials.

S. D. GEHMAN

"The Production and Properties of Plastics." S. Leon Kaye. International Textbook Co., Scranton 9, Pa. Cloth, 6 by 9 inches, 622 pages. Price $5.

This book gives a detailed and technical presentation of the development, chemistry, properties, testing, design, and production of plastics, stressing the importance of relations between all phases of the industry. Many illustrations, diagrams, and charts are used to explain and clarify the text. Of added value are the many shop hints and procedures taken from the author's experience.

Chapters are devoted to the development of plastics; basic principles of manufacture; early plastic materials; phenolic plastics; other thermosetting plastics; thermoplastic resins; other thermoplastic materials; miscellaneous plastics; plastic textile fibers; rubber-like plastics and synthetic rubber; properties and tests of plastics; molds for plastic products; design of plastic articles; compression molding; molding processes for thermoplastic materials; other molding processes for thermosetting materials; laminated products and pressed metal powders; synthetic plastic coatings; finishing molded products; finishing laminates, cast phenolics, and acetate sheets; inspection of plastics; estimates; and future of plastics. Also included are a directory of trade names, a glossary of terms, a selected bibliography, and a subject index.

The volume should be of value as a textbook for high school and college work. Because the presentation goes beyond the elementary stage, the book should also be of service as a reference work for the plastics industry.

NEW PUBLICATIONS

"Determination of Hardness by Means of the Rex Hardness Gage." Compounding Research Report No. 7. Naugatuck Chemical Division of United States Rubber Co., Rockefeller Center, New York 20, N. Y. 8 pages. This bulletin contains information on how to operate the Rex gage, how to read the scale, the accuracy of the gage, and how to clean the instrument. Also appearing is information on the design of the gage by its inventor, John G. Zuber.

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FOR FURTHER DETAILS, SEE AD ON PAGE 436

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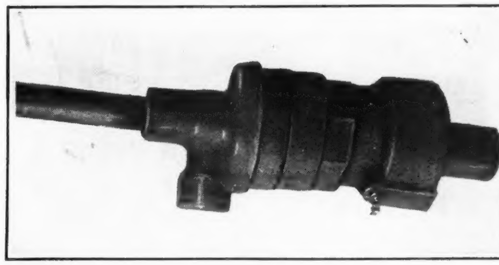

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"Making Wired-on Cycle Tires by the Dunlop-Shaw Patent Monoband Process." Leaflet No. RT 310. Francis Shaw & Co., Ltd., Corbett St. and Ashton New Road, Manchester 11, England. 8 pages. This bulletin describes and illustrates the Monoband process for making wire beaded cycle tires in one operation, including the application of the tread. Other machinery required for the process in conjunction with the Monoband machine is described and shown, including fabric slitters, spool wrappers, bead wire fabric slitters, bead wire covering machines, tread batch-up gear, and vulcanizing press.

"Advantages of Philblack A in Natural Rubber-Reclaim Mixtures." Philblack Bulletin No. 7, November, 1947. Phillips Petroleum Co., Akron, O. 3 pages. Extensive laboratory test data are presented comparing Philblack A with EPC black in mixtures of natural and reclaimed rubber. Philblack A is shown to give higher modulus, rebound, and flex values than EPC; hardness, angle abrasion, and high-temperature tear resistance remain equal; and tensile, elongation, heat build-up, and room temperature tear resistance are lower with Philblack A than with EPC black.

"Nuso 250—New High Viscosity Petroleum Plasticizer." Technigram, November 17, 1947. Standard Oil Co. of New Jersey, 15 W. 51st St., New York 19, N. Y. 8 pages. This bulletin offers complete information on the properties of Nuso 250, a new petroleum oil of low aniline point, whose S.U.V. viscosity changes from 45,000 secs. at 100° F. to 254 secs. at 210° F. Discussions cover the use of Nuso 250 in floor tile, caulking and potting compounds, Goodyear welt sole filler, rubber compounding, wax compositions, and other applications. Included are test data on the effect of varying amounts of Nuso 250 in typical GR-S and neoprene stocks.

"Processing Natural Rubber and Synthetic Polymers." Sun Oil Co., Philadelphia 3, Pa. 30 pages. Part I of this booklet reviews natural rubber, the different synthetic rubbers, rubber compounding and processing, and applications of the company's products as processing aids. The second part gives data and formulations on the use of Sun products in various rubber compounds, including neoprene tire, inner tube, and industrial roll stocks, natural rubber wire insulation and sponge stocks, and GR-S tire, heavy footwear, and sponge stocks. A table on the replacement of stearic acid with Sunaptic Acid-130 also appears.

"'Thiokol' Liquid Polymer LP-2." Thiokol Corp., Trenton 7, N. J. 18 pages. Information in this booklet covers the general properties of LP-2, methods of curing the material, suitable extenders and modifiers for use in compounding, and various applications of the cured compound.

"Plastics and Rubber." Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y. 8 pages. **"Nekal A."** Bulletin G-485. General Dyestuff Corp., New York 14, N. Y. **"1947 Classified Directory."** Eleventh Edition. Association of Consulting Chemists & Chemical Engineers, Inc., 50 E. 41st St., New York 17, N. Y. 120 pages. **"Bi-Monthly Supplement to All Lists of Inspected Appliances, Equipment, Materials."** October, 1947. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill. 78 pages. Publications of American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.: **"A.S.T.M. Standards on Electrical Insulating Materials."** September, 1947. Paper, 6 by 9 inches, 590 pages. **"A.S.T.M. Standards on Textile Materials."** October, 1947. Paper, 6 by 9 inches, 528 pages. Price of each book, $3 to members; $4 to non-members. Publications of The British Rubber Producers' Research Association, Inc., 48 Tewin Rd., Welwyn Garden City, Herts., England: Nos. 83 and 85. **"The Addition of Thio-Compounds to Olefins.** Part I. Reactions of Thioglycollic Acid, Thiophenol and Isopentanethiol." "Part II. Reactions of Thiolacetic and Mono-, Di-, and Tri-Chlorothiolacetic Acids." J. I. Cunneen. 5 and 12 pages, respectively. No. 84. **"Equilibrium Properties of High Polymer Solutions and Gels."** Goeffrey Gee. 12 pages. No. 82. **"Certain Fundamental Concepts Relating to Non-Polar Mechanisms in Olefinic Systems."** E. H. Farmer. 8 pages. Communications of the Rubber Foundation, Delft, Holland: Nos. 53-55 (May, 1947.) **"Preparation and Properties of Rubber-Like High Polymers.** Part I. Polymerization of Dienes and Vinyl Compounds in Bulk. Part II. Polymerization of Mixtures in Bulk. Part III. Polymerization of Mixtures in Emulsion." C. Koningsberger and G. Salomon. 64 pages.

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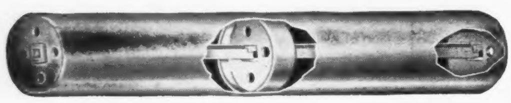
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Market Reviews

CRUDE RUBBER

Commodity Exchange

WEEK-END CLOSING PRICES

1947	Oct. 31	Nov. 29	Dec. 6	Dec. 13	Dec. 20	Dec. 27
Dec.	21.40	22.00	19.85	21.95	21.50	[illegible]
1948						
Jan.	20.55	21.65	19.40	20.95	21.25	22.45
Feb.	19.85	21.35	19.25	20.85	21.15	22.35
Mar.	19.74	21.22	19.15	20.75	21.00	22.24
Apr.	19.25	20.85	19.10	20.45	20.35	21.45
May	19.15	20.70	18.95	20.30	20.25	21.35
June	19.00	20.44	18.60	20.20	20.10	20.95
July	18.90	20.34	18.50	20.05	20.00	20.85
Aug.	18.80	20.10	18.10	19.90	19.85	20.55
Sept.-Dec. .	18.70	20.00	18.00	19.80	19.75	20.45
1949						
Jan.-Feb. ...	18.70	20.00	18.00	19.80	19.75	20.45

THE crude rubber futures market on the Commodity Exchange was moderately active during December, and prices were steady, if erratic. Prices moved irregularly downward during the first 10 days of trading, reflecting the dullness of the physical market. Trade and commission house selling also helped depress prices, as did the demands in Washington for continued usage controls. This latter factor had a marked effect on the London and Singapore market, which in turn depressed the domestic market.

Toward the end of the second week in December, prices checked their decline and moved sharply upward as a result of increased factory demand, reports of government stockpile buying, and reports of a sharp drop in Far Eastern stocks. According to reports received by the Exchange, Singapore rubber stocks at the end of November totaled 55,148 tons, as compared with 73,219 tons at the end of October. Trading then fell off again, but prices recovered toward the end of the month on the basis of renewed dealer buying on the strength of the primary market. Contributing to the general optimism pervading the market were reports of heavy buying by the Continent, expectations of increased government stockpile buying, and forecasts of greater factory demand after the turn of the year.

To illustrate price movements during December, January futures opened the month at 21.20¢, declined to a low of 19.15¢ on December 9, recovered and rose steadily to 21.05¢ on December 15, wavered for a few days and advanced to a price of 22.45¢ on December 26, and closed the month at 22.40¢. The most active futures months, based on volume of trading, were March, May, and July. Volume of trading for the month was 28,790 tons, a new monthly high, and compares with 20,920 tons during November. A new daily high for sales was set with 4,900 tons on December 4, the greatest volume for one day since the reopening of the Exchange.

Latices

ACCORDING to Arthur Nolan, Latex Distributors, Inc., writing in Lockwood's December *Rubber Report*, natural rubber latex producers in the Far East are concerned because the price for *Hevea* latex in the U. S. A. has declined almost 4¢ a pound and in Europe about 9¢ a pound during a period when bulk rubber prices recovered substantially. As a result, latex supply gave indication of overtaking demand.

In view of previously estimated large demand in the United States it was suggested that in all such high forecasts two important factors, while considered, were possibly inadequately evaluated or emphasized. GR-S latex was not expected to be so satisfactory an alternate for certain large-volume uses, nor was the price of *Hevea* latex expected to have such an important influence on its consumption.

The price of *Hevea* bulk concentrates is at a low for the year of approximately 30¼¢ a pound, dry weight; while GR-S latices now sell for 18½¢ and 20¼¢ a pound. It was pointed out that producers of solid *Hevea* rubber call for a price of 17½¢ a pound in order to be remunerative to the producer and pay for the necessary replanting. *Hevea* latex must be priced still higher since, unlike synthetic latex, natural latex costs more to produce and ship than does solid rubber. Eventually, however, a lower price than 30¼¢ a pound is predicted for *Hevea* latex.

The following statistics[1] on *Hevea* latices have been reported:

1947	October (Preliminary)	January/October 10 months
Imports	3,085	13,402
Consumption	1,789	10,298*
Stocks (end of month)† ..	4,529	....

[1] All figures estimated long tons dry weight.
*This does not include approximately 2,057 tons of government stocks in stockpile.
† September consumption 1,567 tons: final figure corrected from preliminary figure of 1,646 tons reported last month.

New York Outside Market

WEEK-END CLOSING PRICES

	Oct. 31	Nov. 29	Dec. 6	Dec. 13	Dec. 20	Dec. 27
No. 1 Ribbed Smoked Sheets:						
Dec.	21.63	22.25	20.25	21.38	21.63	23.00
Jan.-Mar. ..	20.00	21.88	19.88	21.00	21.38	22.63
Apr.-June ..	19.25	21.25	19.25	20.50	20.38	21.63
July-Sept. ..	....	....	....	20.00	19.75	21.25
No. 3 Ribbed Smoked Sheets:	20.50	21.75	19.75	21.00	21.13	22.50
No. 2 Amber	17.25	18.00	16.25	16.75	16.63	17.25
Flat Bark ..	15.00	15.25	13.50	13.00	13.75	14.25

MOST of the activity in the New York Outside Market during December was attributed to dealers. Factory interest varied from light to moderate, but was quite sporadic throughout the month. Very little interest was shown by the major companies although it was believed likely that they were continuing to buy on a small scale in the Far East.

The spot price for No. 1 R.S.S. opened the month at 22.75¢, then declined in the face of light interest and an easier supply situation as delayed shipments from the Far East made their arrival. After dropping to 19.63¢ on December 9, the spot price rose irregularly as reports came from the Far East of a sharp decline in supplies, reached a peak of 23.00¢ on December 26, and closed the month at 22.50¢.

The strength of the market during the latter part of December was seen as a direct result of low supplies which put the market in an oversold position. The opinion was expressed that the low level of factory interest reflected adjustments and inventories being made as the year ended, and a pick-up in demand was expected after the first of the year. This opinion is qualified by some observers who believe that near-term factory requirements may have been adequately covered by the sizable purchases that had been made in November.

Fixed Government Prices*

Guayule

Guayule *(carload lots)*	$0.17½

Latex

Normal *(tank car lots)*	.30¾
Centrifuged *(tank car lots)*	.32½

Plantation Grades

No. 1X Rubber Smoked Sheets	.23
1X Thick Pale Latex Crepe	.29
1 Thick Pale Latex Crepe	.29
2 Thick Pale Latex Crepe	.28½
3 Thick Pale Latex Crepe	.28¾
1 X Thin Pale Latex Crepe	.29
1 Thin Pale Latex Crepe	.29
2 Thin Pale Latex Crepe	.28½
3 Thin Pale Latex Crepe	.28¼
Liberian A	.28⅝
AA	.29
RCMA Watermarked Crepe No. 16	.37⅞
17	.32⅜
18	.30⅞
Sole Crepe Trimmings	.28½
No. 1X Thin Pale Latex Crepe Trimmings	.28½
1X Borwn Crepe ...	.21⅞
2X Brown Crepe	.21⅝
2 Remilled Blankets (Amber)	.21¾
3 Remilled Blankets (Amber)	.21⅝
Rolled Brown	.185

Synthetic Rubber

GR-M (Neoprene GN)	.27½
GR-S (Buna S)	.18½
GR-I (Butyl)	.18½

Wild Rubber

Upriver Coarse (crude)	.12⅝
(Washed and dried)	.20¼
Islands Fine (crude)	.14⅝
(Washed and dried)	.22½
Caucho Ball (crude)	.11⅝
(Washed and dried)	.19½
Mangabiera (crude)	.08½
(Washed and dried)	.18

* For a complete list of all grades of rubbers see Rubber Reserve Co. General Sales and Distribution Circular, July 1, 1945, as amended.

SCRAP RUBBER

THE improved tone of the scrap rubber market first noticeable in November crystallized into high prices during December. Dealers reported increased demand for tires and tubes resulting from the lower scrap stocks being held by reclaimers. The price of mixed auto tires rose from $10.00 to $12.00 per net ton in the East, corresponding with the Akron price. S. A. G. passenger tires advanced from $13.50 to $15.00 per net ton both in the East and in Akron. Red passenger tube prices rose from 5.0¢ to 6.0¢ per pound, and the price of black passenger and truck tubes advanced from 3.75¢ to 4.0¢ per pound. Prices are said to be firm at these levels. Peelings were steady and unchanged, since little splitting is being done at present.

There has been fairly good demand for tires for export, and shippers say that the only restrictive factor is the dollar shortage abroad. Tires for export are being quoted at $12 to $13 per net ton; black tubes at 5.0¢ per pound; and red tubes at 6.25¢ to 6.5¢ per pound for the export market.

Following are dealers' buying prices for scrap rubber, in carload lots, delivered points indicated:

	Eastern Points	Akron, O.
	(Net per Ton)	
Mixed auto tires	$12.00	$12.00
Truck and bus tires	nom.	nom.
Beadless tires	nom.	nom.
S.A.G. passenger (natural)	15.00	15.00
(Synthetic)	nom.	nom.
Truck (natural)	12.50	12.50
(Synthetic)	nom.	nom.
No. 1 peelings (natural)	42.50	42.50
(Synthetic)	nom.	nom.
(Recap.)	nom.	no.m
No. 2 peelings (natural)	27.50	27.50
(Synthetic)	nom.	nom.
(Recap.)	nom.	nom.
No. 3 peelings (natural)	25.00	25.00
(Synthetic)	nom.	nom.
	(¢ per Lb.)	
Mixed auto tubes	4.0	4.0
Red passenger tubes	6.0	6.0
Black passenger tubes	4.0	4.0
Truck tubes	4.0	4.0
Mixed puncture-proof tubes	nom.	nom.
Air brake hose	nom.	nom.
Rubber boots and shoes	nom.	nom.

RECLAIMED RUBBER

BUSINESS is good in the reclaimed rubber market. Production continues at a high level; exports remain at approximately 2,000,000 pounds a month; and demand is very good. The slowdown of the late summer months is definitely over, and the industry is now operating at a peak. The major contributing factor to the reclaim industry's prosperity is the relatively high natural rubber price, and reclaimers foresee no important changes in the natural rubber market for at least a few months.

Final September and preliminary October statistics on the reclaim industry are now available. Production of reclaimed rubber during September totaled 22,561 long tons; consumption, 23,801 long tons, exports, 901 long tons; and month-end stocks, 38,461 long tons. For October, preliminary figures show a production of 25,627 long tons; consumption, 2?,898 long tons; exports, 1,016 long tons; and end-of-month stocks, 36,864 long tons.

There were no reclaimed rubber price changes last month.

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	8 / 8.5
Peel	1.18-1.20	9 / 9.5
Inner tube		
Black	1.20-1.22	12.75/13.25
Red	1.20-1.22	13.5 /14
GR-S	1.18-1.20	9.5 /10
Butyl	1.16-1.18	8.5 / 9
Shoe	1.50-1.52	8.25/ 8.75

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

RAYON

THE first general rayon yarn and staple price increase since February, 1947, was made by E. I. du Pont de Nemours & Co., Inc., December 8 with the announcement of an average 10% increase in prices of all categories. Other rayon producers said that a price increase was justified under current market conditions, but feared it would result in another round of increases for rayon fabrics, a serious problem in view of growing consumer resistance. Inasmuch as most companies have already committed themselves for January delivery, a decision on prices for later shipments was not forthcoming at once. Industrial Rayon Corp. did announce that it is entering orders for January at no increase in price.

Total November domestic rayon shipments were 83,900,000 pounds, 5% below the October total. For the first 11 months of 1947, rayon deliveries amounted to 868,-500,000, 12% greater than the corresponding 1946 period. November filament yarn deliveries totaled 62,500,000 pounds, of which 42,700,000 pounds were of viscose and cupra, and 19,800,000 pounds were of acetate. Staple deliveries in November amounted to 21,400,000 pounds, of which 15,400,000 pounds were of viscose and the balance of acetate. Rayon stocks held by producers at the end of November amounted to 13,700,000 pounds and consisted of 5,500,000 pounds viscose and cupra yarn, 2,700,000 pounds acetate yarn, and 5,500,000 pounds staple.

COTTON AND FABRICS

New York Cotton Exchange
Week-End Closing Prices

Futures	Oct. 25	Nov. 29	Dec. 6	Dec. 13	Dec. 20	Dec. 27
Feb.	32.89	35.53	35.74	36.31	35.71	35.67
Apr.	32.96	35.44	35.54	36.18	35.69	35.65
June	32.47	34.78	34.78	35.33	34.98	34.98
Aug.	31.32	33.26	32.22	33.07	33.45	33.45
Oct.	29.60	31.20	31.22	31.65	31.54	31.52
Dec.	29.25	30.40	30.54	30.97	30.98	30.91

THE cotton market was quiet during December, and observers stated that little activity could be expected until after the first of the year. Prices were irregular, but showed no wide fluctuations as a consequence of sporadic but moderate mill buying. An increase in commission house liquidation and hedging resulted from the sharp gains of previous months and prevented further price advances. Other factors contributing to the thin market were pessimism over future foreign purchasing, reports of increased rayon production in Europe, and expectations that southern cotton holders would not release their cotton until after the first of the year. Mills were generally in a better supply situation and were reluctant to overload their inventories as the year-end approached.

The 15/16-inch middling spot price remained in the 36.00-37.50¢ price range throughout the month. The December 1 spot price was 36.72¢, reached the monthly peak of 37.35¢ on December 10, fluctuated irregularly, and closed the month at 36.92¢. March futures paralleled the spot market movements, selling at 35.96¢ on December 1, reaching 36.52¢ on December 10, and closing at 36.10¢ on December 31.

Effective December 1, margin requirements were increased on all transactions on the New York Cotton Exchange which exceed 34¢ per pound. The new regulations require the posting of $30 a bale for transactions from 34.01-35.00¢, an advance of $5 a bale. For every 1¢ increase from that point, another $5 a bale is required.

The government's last crop estimate for the season, issued December 8, placed the crop at 11,694,000 bales. This was 189,000 bales greater than the previous crop estimate issued November 1 and came as a surprise to the trade, which had expected the new estimate to be about 100,000 bales under the previous one.

Despite some expressed fears that the market was over-extended, most quarters are fairly optimistic about higher prices for cotton in early spring, although many sources agree that a slight dip may be encountered some time in January. If domestic and foreign demand lives up to expectations, observers believe the market will recover this lost ground and possibly move up to even more advanced levels.

Fabrics

Market conditions for industrial gray goods were rather dull last month. The bulk of first-quarter production on staple constructions was finished up early in the month, and thereafter trading was very scattered and did not represent any large volumes. Some chafer fabric business was put through, but observers said that the rubber companies were confining their purchases to one or two constructions instead of taking up to four varieties of chafer fabrics, as had been their custom.

Prices remained firm for print cloths, and demand was fairly good, except for spot and nearby deliveries. A general lull was also felt in the sheeting market as desired constructions or deliveries were found to be unobtainable. In general, drills and twills were moving slowly, with prices reported firm with little change. An upward trend was notable in the osnaburg market with first quarter deliveries in demand.

Third-Quarter Statistics on Carbon Black

FOLLOWING are statistics for the production, shipments, producers' stocks, and exports, in pounds, of carbon black for the third quarter of 1947. Production, shipments, and inventory figures are compiled from reports made available to the United States Bureau of Mines by the National Gas Products Association and by direct reports from producing companies whose operations are not covered by the Association. Export figures are reported by the U. S. Department of Commerce, but are not fully comparable in a given month because of the lapse of time between loading at producing plants and clearance for export.

	July	August	September	First Nine Months, 1947
Production:				
Contact types	56,099,000	56,731,000	56,159,000	482,100,000
Furnace types	57,802,000	56,949,000	56,040,000	493,854,000*
Totals	113,901,000	113,680,000	112,199,000	975,954,000
Shipments:				
Contact types	55,085,000	57,251,000	57,770,000	489,440,000
Furnace types	47,989,000	46,493,000	42,525,000	503,872,000
Totals	103,074,000	103,744,000	100,295,000	993,312,000
Producers' stocks, end of month:				
Contact types	10,512,000	9,992,000	8,381,000	8,381,000†
Furnace types	24,488,000	34,944,000	48,459,000	48,459,000†
Totals	35,000,000	44,936,000	56,840,000	56,840,000
Exports‡, total	28,553,000	40,478,000	32,470,000	260,055,000

*Partly estimated.
†Adjusted for losses, etc.
‡From records of the Department of Commerce.

Rims Approved and Branded by The Tire & Rim Association, Inc.

Rim Size	Nov., 1947
15" & 16" D. C. Passenger	
15x4.00E	19,577
16x4.00E	419,479
15x4.50E	5,657
16x4.50E	255,483
15x5.00E	78,567
16x5.00F	42,195
15x5.50F	60,845
16x5.50F	14,735
16x6.00F	7,694
16x4.00E—Hump	239,497
15x4.50E—Hump	483
16x4.50E—Hump	9,953
15x5-K—Hump	24,594
15x5½-K—Hump	70,519
15x6-L—Hump	17,726
15x6½-L—Hump	1,117
15x4½-K	37,455
16x4½-K	9,092
15x5-K	195,239
16x5-K	94,830
15x5½-K	3,802
16x5½-K	16,836
15x6-L	29,556
16x6-L	74,752
15x6½-L	40,132
17" & Over Passenger	
18x2.15B	2,145
Flat Base Truck	
17x4.33R	8,265
20x4.33R	31,772
17x5.0	30,524
18x5.0	10,224
20x5.0	13,948
17x5.00S	284
20x5.00S	11,236
17x5.5	4,401
20x5.5	2,780
20x6.0	132,773
20x6.00S	66,818
20x6.00T	51,666
24x6.00T	90
20x6.5	2,180
15x7.0	423
20x7.0	15,125
20x7.33V	36,666
22x7.33V	10,302
24x7.33V	2,625
20x7.5	4,873
22x7.5	5,056
24x7.5	2,242
20x7.50V	10,369
22x7.50V	410
24x7.50V	749
20x8.0	414
20x8.00V	2,562
24x8.00V	214
24x8.37V	2,247
24x9.00V	249
20x10.0	97
24x10.00W	1,535
Semi D.C. Truck	
16x4.50E	623
15x5.50F	7,431
16x5.50F	50,057
Tractor & Implement	
12x2.50C	25,237
12x3.00D	25,781
15x3.00D	24,593
16x3.00D	9,334
19x3.00D	16,591
24x3.00D	330
40x3.00D	534
16x4.25KA	1,615
16x4.75KA	6,216
18x5.50F	20,231
20x5.50F	9.544
24x6.00S	321
36x6.00S	1,789
20x8.00T	194
24x8.00T	5,605
28x8.00T	1,348
W7-24	1,777
W8-24	20,447
W8-36	3,333
W9-24	3,916
W9-28	2,871
W9-38	5.537
W10-28	6,721
W10-36	2,421
DW9-38	8,669
DW10-38	14,820
DW10-42	990
DW11-26	258
DW11-28	5,036
DW11-30	301
DW11-32	1,366
DW12-30	282
DW12-34	285
DW16-26	15
Earth Mover	
20x11.25	355
24x11.25	209
24x13.00	575
24x15.00	71
Total	2,522,709

United States Imports, Exports, and Reexports of Crude and Manufactured Rubber

Imports for Consumption of Crude and Manufactured Rubber

	May, 1947		June, 1947		First Six Months, 1947	
Unmanufactured, (Lbs.)	Quantity	Value	Quantity	Value	Quantity	Value
Crude rubber	205,897,279	$47,208,658	139,652,296	$28,339,739	862,565,695	$171,183,518
Rubber latex	1,708,463	442,050	6,328,012	1,642,417	14,660,293	3,985,823
Guayule	772,400	186,201	1,240,900	298,705	6,017,100	1,440,261
Balata	475,456	208,440	170,866	63,612	2,154,444	1,090,773
Jelutong or Pontianak	1,173,926	259,745	185,859	37,314	2,346,717	569,830
Gutta percha	192,797	164,611	105,317	88,420	534,012	441,038
Chicle	1,315,629	1,115,812	1,045,296	901,065	10,929,745	9,679,316
Reclaimed rubber	......	......	......	......	40,406	3.287
Scrap rubber	1,723,301	41,330	1,505,671	19,125	6,612,812	141,600
Totals	213,259,251	$49,626,847	150,233,917	$31,390,397	905,861,224	$188,535,446
Manufactured						
Tires: auto, bus, truck no.	644	$13,287	565	$24,699	8,708	$105,931
Bicycle no.	3,349	5,327	1,289	4,311	10,705	20,568
Other no.	......	......	......	......	5,000	3,024
Inner tubes no.	2,068	9.196	4,011	13.748	22,911	78,917
Rubber boots, shoes, and overshoes prs.	......	......	2,448	1,546	3,207	2,612
Rubber-soled footwear with fabric uppers prs.	67,043	82,424	180,648	224,509	791,742	982,216
Rubber heels and soles doz. prs.	......	......	......	......	23,454	3,502
Athletic balls: golf	37,680	13,371	4,800	1,333	65,480	22,745
Lawn tennis	13,200	3,508	576	118	17,032	4,692
	......	......	112	480	5,649	3,076
Rubber toys	......	......	......	191	......	360
Hard rubber products	......	3,283	......	1,194	......	6,780
Rubberized printing blankets	225	1,058	1,454	6,729	4,693	22,913
Rubber and cotton packing lbs.	808	1,071	1,344	1.779	17,317	23,152
Rubber gasket and valve packing lbs.	......	34	......	22	......	1,146
Rubber belting lbs.	1,085	803	840	822	3,226	3,500
Rubber hose and tubing	......	127	......	32	......	477
Rubber bands lbs.	1	1	......	......	2	2
Soft rubber: druggists' sundries	......	......	......	1,514	......	1,989
Other products	......	3,511	......	13,993	......	77,037
Other rubber products	......	......	......	1,012	......	1,012
Gutta percha products lbs.	355	252	......	......	355	252
Rubber substitute products	6,250	1,156	6,644	1,260	28,456	5,281
Totals	132,708	$138.409	204,731	$299,319	1,007,937	$1,371,184
Grand Totals, All Rubber Imports	213,391,959	$49,765,256	150,438,648	$31,689,716	906,869,161	$189,906.630

Reexports of Foreign Merchandise

	May, 1947		June, 1947		First Six Months, 1947	
Unmanufactured, (Lbs.)	Quantity	Value	Quantity	Value	Quantity	Value
Crude rubber	26.800	$9,169	105,402	$22,998	4.784,066	$1,243,081
Balata	165,613	87,768	49.348	44,769	861,754	589,135
Chicle	11,988	5.394	53,626	34,589	93,230	68,484
Jelutong and gutta percha	......	......	2,204	1,855	2,204	1,855
Totals	204,301	$102,331	210,580	$104,211	5,741,254	$1,902,555
Manufactured						
Tire casings and tubes no.	60	$3,380	136	$5,851	3,196	$11,904
Rubber and balata belting lbs.	824	1,122	......	......	7,266	6,843
Rubber hose, tubing lbs.	......	......	401	774	655	977
Rubber and friction tape lbs.	......	......	......	......	146	125
Rubber packing lbs.	......	......	613	362	3,098	4,737
Rubber mats and flooring lbs.	......	......	......	......	660	273
Rubber cement gals.	......	......	......	......	400	590
Hard rubber products	......	......	......	......	72	110
Druggists' sundries	......	......	......	......	......	6,703
Rubber or rubberized clothing	......	......	......	180	......	180
Other rubber products	......	57	......	......	......	5,243
Gutta percha manufactures lbs.	......	......	11,025	7,500	11,025	7,500
Compounded latex and other rubber for further manufacture lbs.	......	......	1,350	945	1,350	945
Totals	884	$4,559	13,525	$15,612	27,868	$46,130
Grand Totals, All Rubber Reexports	205,185	$106,890	224,105	$119,823	5,769,122	$1,948,685

Exports of Domestic Merchandise

	May, 1947		June, 1947		First Six Months, 1947	
Unmanufactured, (Lbs.)	Quantity	Value	Quantity	Value	Quantity	Value
Crude rubber	......	......	......	......	10,885	$6,616
Chicle	187,652	$102,958	5,055	$2,408	999,958	812,028
Balata	......	......	1,000	2,980	47,451	50,222
Jelutong and gutta percha	......	......	25	50	25	50
Synthetic rubber: GR-S	523,182	100,884	4,466,704	857,146	17,084,642	3,321,126
Butyl	109,243	20,552	......	......	123,488	24,114
Neoprene	260,687	73,905	517,909	139,348	3,619,047	1,108,819
Nitrile	79.557	31,658	137,382	55,905	696,190	302,623
"Thiokol"	3,007	2,420	164	54	19,671	16,341
Polyisobutylene	11,068	2,787	6,662	2,132	116,626	23,149
Other	1,870	1,611	664	534	130,086	35,094
Reclaimed rubber	2,847,526	220,427	2,687,987	207,466	16,568,344	1,297,636
Scrap rubber	3,286,293	110,179	2,700,668	112,606	37,419,469	1,310,122
Totals	7,310,085	$667,381	10,524,200	$1,380,629	76,835,882	$8,307,940

The term

"COTTON FLOCKS"

does not mean cotton fiber alone

EXPERIENCE

over twenty years catering to rubber manufacturers

CAPACITY

for large production and quick delivery

CONFIDENCE

of the entire rubber industry

KNOWLEDGE

of the industry's needs

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acknowledged superior by all users are important and valuable considerations to the consumer.

Write to the country's leading makers for samples and prices.

CLAREMONT WASTE MFG. CO.

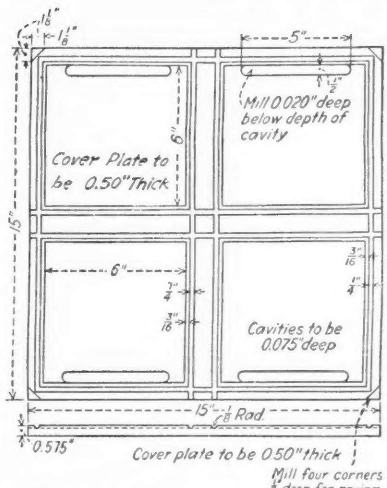
CLAREMONT N. H.

The Country's Leading Makers

HOGGSON BRAND Since 1849

MOLDS & DIES FOR RUBBER TESTING

ONE OF THE MANY MOLDS AVAILABLE



Molds from 7" to 24" sq. for tension samples, and molds for compression samples if desired. Molds in dimensions varying from 1" x 1" x 1/4" up for abrasion test samples. Molds and dies for slab curing. Please describe your need.

HOGGSON & PETTIS MFG. CO.

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Charles T. Wilson Co., Inc.

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Synthetic Rubbers

Liquid Latex

Balatas, Guayule, Gums

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Distributor of

GR-S Synthetic Latices

By Appointment of Office of Rubber Reserve

BRANCHES AND SALES REPRESENTATIVES

Charles T. Wilson Co., Inc., United Bldg., Akron, Ohio
Ernest Jacoby & Co., 79 Milk St., Boston, Mass.
Reinke & Amende, Inc., 1925 East Olympic Blvd., Los Angeles, Cal.
Charles T. Wilson Company (Canada) Ltd., 406 Royal Bank Building, Toronto, Canada

The Higher the Pressure ...the Tighter the Valve

On hydraulic presses of all types this Yarway Hydraulic Valve will give long life with minimum maintenance. Automatically regrinds its own sealing surfaces. Small and compact. Easy to install and operate.

Yarway Single-Pressure Hydraulic Valves are made in straightway, three-way and four-way types; in five sizes for pressures up to 5000 lbs. Also Yarway Two-Pressure Valves in two sizes for pressures up to 4000 lbs. Write for Bulletin H-209.

YARNALL-WARING CO.

103 Mermaid Ave., Philadelphia 18, Pa.

YARWAY

Improved Type HYDRAULIC VALVE

Exports of Domestic Merchandise *(Continued)*

	May, 1947		June, 1947		First Six Months, 1947	
	Quantity	Value	Quantity	Value	Quantity	Value
MANUFACTURED						
Rubber cement ....*gals.*	80,296	$113,061	49,230	$70,808	441,959	$574,702
Rubberized fabric: auto cloth ......*sq. yds.*	43,773	39,678	42,577	36,801	341,663	212,184
Piece goods and hospital sheeting *sq. yds.*	276,852	180,432	184,111	157,742	1,525,171	1,090,485
Rubber footwear: boots *prs.*	52,501	205,307	37,535	130,410	306,261	1,065,928
Shoes ....*prs.*	34,788	53,177	88,730	147,469	459,181	783,348
Rubber-soled with fabric uppers ....*prs.*	106,771	158,223	102,644	162,327	705,875	1,034,671
Soles ....*doz. prs.*	16,532	50,168	12,977	37,857	154,941	384,824
Heels ....*doz. prs.*	53,999	56,717	61,108	63,864	546,910	489,139
Rubber soling and top lift sheets ....*lbs.*	81,099	21,601	104,829	27,735	1,114,627	261,137
Rubber gloves and mittens ......*dos. prs.*	28,499	85,966	20,825	74,923	181,587	578,860
Druggists' sundries: water bottles and fountain syringes....*no.*	90,466	52,586	72,479	45,195	539,536	313,997
Other	......	395,615	......	407,967	......	2,614,901
Rubber and rubberized clothing	......	260,655	......	94,250	......	1,757,738
Balloons	......	140,063	......	140,402	......	1,013,044
Rubber toys and balls ..	......	43,586	......	63,236	......	328,993
Bathing caps ......*doz.*	4,996	14,323	2,668	11,377	41,502	173,234
Rubber bands ....*lbs.*	28,513	21,727	22,100	15,182	185,360	137,247
Erasers ....*lbs.*	66,251	67,398	40,442	43,231	364,382	357,416
Hard rubber goods: battery boxes ......*no.*	56,059	35,731	66,945	64,798	333,426	269,358
Other electrical goods.......... *no.*	427,723	104,615	215,098	100,295	1,188,523	531,181
Combs ....*doz.*	6,426	10,159	9,940	8,902	68,472	70,756
Other	......	16,672	......	19,192	......	106,177
Tire casings: truck and bus ....*no.*	223,029	8,845,279	187,185	7,165,081	1,137,877	45,605,417
Auto ....*no.*	251,383	3,112,682	211,098	2,638,346	1,151,480	15,093,467
Inner tubes: auto, truck, and bus ....*no.*	451,529	1,433,164	306,465	978,065	1,884,347	6,528,933
Other tire casings and inner tubes ......*no.*	118,689	1,129,889	183,074	1,056,273	712,367	6,242,361
Solid tires: auto and truck ....*no.*	30,990	648,730	18,844	321,819	93,114	2,311,390
Other ....*lbs.*	97,168	32,207	12,449	4,275	231,380	85,236
Tire repair materials: Camelback ......*lbs.*	854,227	201,102	339,382	90,512	4,653,656	1,138,009
Other ....*lbs.*	445,824	258,468	551,456	188,957	3,844,024	1,731,581
Rubber and friction tape ....*lbs.*	128,911	71,806	159,279	100,293	866,412	473,474
Rubber belting: auto fan belts ....*lbs.*	236,665	255,613	225,018	235,334	1,267,124	1,353,116
Other ....*lbs.*	1,320,530	1,239,007	1,288,747	1,364,152	8,759,928	8,041,433
Hose and tubing: garden hose ....*lbs.*	66,661	23,383	55,688	25,927	312,366	142,069
Other ....*lbs.*	1,467,547	1,002,131	1,134,575	741,631	7,089,673	4,620,579
Rubber packing .....*lbs.*	258,508	187,486	229,825	195,862	1,342,080	956,635
Rubber mats, flooring, and tiling ....*lbs.*	497,483	150,918	522,360	121,464	3,252,005	1,174,334
Rubber thread: bare *lbs.*	48,287	66,495	17,054	28,395	486,738	667,035
Textile covered ..*lbs.*	17,684	44,632	7,804	15,900	74,133	182,051
Gutta percha manufactures ....*lbs.*	8,272	8,929	6,052	6,769	45,082	50,401
Compounded latex and other rubber for further manufacture ....*lbs.*	392,012	156,076	356,535	111,804	1,844,552	781,006
Other rubber products ..	......	421,417	......	284,648	......	1,895,316
TOTALS	8,370,943	$21,416,874	6,947,128	$17,599,470	47,596,315	$111,447,548
GRAND TOTALS, ALL RUBBER EXPORTS ..	15,681,028	$22,084,255	17,471,328	$18,980,099	124,432,197	$119,755,488

SOURCE: Bureau of Census, United States Department of Commerce.

United States Rubber Statistics, September, 1947

(All Figures in Long Tons, Dry Weight)

	New Supply			Distribution		Stocks,
	Production	Imports	Total	Consumption	Exports	End of Month
Natural rubber, total	0	45,725	45,725	48,990	174	118,053
Natural latex, total	0	516	516	1,567	0	4,044
Natural rubber and natural latex: total	0	46,241	46,241	50,557	174	122,097
Synthetic rubber, total	28,802* 1,716†	0	30,518	41,865	343	79,296
GR-S	23,838* 273†	0	24,111	33,373	51	54,181‡
Butyl	3,465*	0	3,465	5,185	0	15,375
Neoprene	1,499* 651†	0	2,150	2,935	235	6,127
Nitrile types	792†	0	792	372	57	3,613
Natural rubber and latex, and synthetic rubber, total	30,518	46,241	76,759	92,422	517	201,393
Reclaimed rubber, total	22,561	0	22,561	23,801	901	38,461
Grand totals	53,079	46,241	99,220	116,223	1,418	239,854

* Government plant production.
† Private plant production.
‡ Includes 50 tons shipped for export, but not cleared.
SOURCE: OMD, United States Department of Commerce.

Compounding Ingredients—Price Changes and Additions

Hard Hydrocarbon ....*ton.*	$42.00	/	$44.00
Philblack O ....*lb.*	.07		
Pyrax A ....*ton*	12.50		
W.A. ....*ton*	14.00		
Rayox LW ....*lb.*	.175	/	.185
R-110 ....*lb.*	.195	/	.205
S.A. 62-O ....*lb.*	1.00		
Ti-Cal ....*lb.*	.0675		
Ti-Pure ....*lb.*	.175	/	.195
Vanfre ....*gal.*	2.00	/	2.50

Trade Lists Available

The Commercial Intelligence Division of the United States Department of Commerce recently compiled the following trade lists, of which mimeographed copies may be obtained by American firms from this Division and from Department of Commerce field offices. The price is $1 a list for each country.

Automotive Equipment Importers and Dealers—Belgium: Czechoslavakia: Palestine.

Dental Supply Houses—Morocco.

Machinery Importers and Distributors—Austria.

Office Supply and Equipment Dealers and Importers—Ireland: Indo-China: Morocco: Cuba

Rubber Goods Manufacturers—Chile: Spain India: Sweden.

Foreign Trade Opportunities

The firms and individuals listed below have recently expressed their interest in buying in the United States or in United States representations. Additional information concerning each import or export opportunity, including a World Trade Directory Report, is available to qualified United States firms and may be obtained upon inquiry from the Commercial Intelligence Unit of the United States Department of Commerce, or through its field offices, for $1 each. Interested United States companies should correspond directly with the concerns listed concerning any projected business arrangements.

Export Opportunities

Mrs. Elizabeth Wolkenstein, representing Elizabeth Bankin, 163 Collins St., Melbourne, Victoria, Australia: materials and machinery used in manufacturing corsets.

Wm. Roger Westcott, representing Botany Knitting Mills. Ptyl Ltd., 200 Nicholson St., Fitzroy, Melbourne, Victoria, Australia: satin Lastex.

M. D., A. W., and Mrs. G. M. Rane, representing Dadejee Dhackjee & Co., Ltd., Shree Pant Bhuwan, Sandhurst Bridge, Bombay, India: chemicals, plastic molding powders.

Palais des Parfums, 82-84 Blvd. Anspach, Brussels, Belgium: household rubber gloves, rubber soap racks.

Discuss Plastics Technology

(*Continued from page* 502)

tics Industry. Attended by 100 members, the meeting was held at the Clark Hotel, Los Angeles, Calif., with Chairman R. B. Gutsch, of aaRBee Plastic Co., presiding. According to *Pacific Plastics*, a true story of intensive selling of a new plastics product, the My Name marking set, was presented by Ronald K. Duke, of Ronald K. Duke Co., and Al Atherton, of Atherton & Co. The speakers considered in detail the selling methods used for the new product, including merchandising material, advertising media, and other publicity work.

The audience also saw a motion picture on the Rockford Hy-Jector machine, provided by Merle Barron, Machinery Sales Corp., and screened by Bill Kidder, Wilson & Geo. Meyer Co. Guests of honor at the meeting were introduced by Program Chairman Ralph David, of *Pacific Plastics*.

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

Effective July 1, 1947

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.25 per line (ten words)	Light face type 40c per line (ten words)	Light face type $1.00 per line (ten words)
Bold face type $1.60 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.40 per line (eight words)
Allow nine words for keyed address.	**Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.**	*Replies forwarded without charge*

SITUATIONS OPEN

An old manufacturing concern of almost 60 years, a Manufacturer of Adhesives and Chemicals is in need of a Superintendent in its Adhesives Department to check the compounders and to see that it gets a uniformity of materials going out the door. This applies to Natural or Synthetic Rubber, and also to the different types of Adhesives which we manufacture. We have a very fine opening with a good salary for the right party. All replies will be strictly confidential. Address Box No. 8, Care of INDIA RUBBER WORLD.

WANTED: PATTERN MAN AND SHOE DESIGNER FOR RUBber footwear factory. In reply state age, education, details of experience, and salary expected. Address Box No. 13, care of India RUBBER WORLD.

FACTORY MANAGER—TO TAKE COMPLETE CHARGE SMALL plant. Must have knowledge of installation and maintenance of equipment and handling of labor, also some chemical experience, preferably in hard rubber. All replies confidential. Address Box No. 14, care of India RUBBER WORLD.

CHEMIST, LATEX DIPPED GOODS, QUALIFIED FOR LABORAtory supervision on compounding, research, and manufacture with substantial concern in this field. Address Box No. 15, care of India RUBBER WORLD.

FACTORY MANAGER EXPERIENCED IN COMPOUNDING AND manufacture of mechanical goods, natural and synthetic rubber. Excellent opportunity. Address Box No. 16, care of India RUBBER WORLD.

ENGINEER—AGE 25 to 40, WITH SOME MECHANICAL GOODS production and engineering experience. This is an unusual opportunity in mechanical rubber products of a highly specialized nature. Extensive experience not absolutely necessary. Address Box No. 17, care of India RUBBER WORLD.

WANTED: AN OPERATING PRODUCTION MANAGER CAPable of taking complete charge of plant manufacturing rubberized fiber pads for upholstering and allied trades. Knowledge of textile machinery necessary, and experience with latex useful. Would pay $15,000 for right man. Address in writing: T. A. Unsworth, President, Queen City Tulatex Corp., Burlington, Vermont. All applications kept strictly confidential.

SITUATIONS WANTED

TECHNICAL REPRESENTATIVE: B.S., FIVE YEARS' REsearch and development of organic chemicals. Technical sales experience in plastics, emulsifiers, resins, waxes, plasticizers, etc. Desires permanent technical representative position. Employed as project supervisor, synthetic rubber pilot-plant. Married. Family. Age 33. Address Box No. 9, care of India RUBBER WORLD.

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WORKS MANAGER CHEMIST, B.A., B.Sc. (OXFORD, ENGland), A.R.I.C., married, age 34, with 12 years' experience in quality control, research, development, production, and personal management in tires, tubes, mechanical goods, wire and cable insulation, sponge and hard rubbers, and plastics, desires responsible position commensurate with capabilities in New England or metropolitan New York area. Address Box No. 23, care of INDIA RUBBER WORLD.

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(Classified Advertisements Continued on Page 551)

Malayan Rubber Statistics

The following statistics for October, 1947, have been received from Singapore by way of Malaya House, 57 Trafalgar Square, London, W.C.2, England.

Ocean Shipments from Singapore and Malayan Union—In Tons

	Sheet and Crepe			Latex, Concentrated Latex, and Revertex (Dry Rubber Content)		
		Malayan Union			Malayan Union	
To	Singapore Export Proper	Trans-shipped	Direct Shipments	Singapore Export Proper	Trans-shipped	Direct Shipments
Argentine Republic	5	..	..	10	..	..
Belgium	231	153	382	16	23	7
Canada	1,194	217	2,290	..	..	..
Chile	20	..	..	..	..	..
China	2,016	50	..	..	..	..
Cuba	10	2	40	..	..	..
Cyprus	3	..	..	..	..	..
Czechoslovakia	..	..	2	..	..	22
Denmark	100	70	302	2	..	..
Egypt	10	..	2	..	..	..
Finland	40	..	150	..	..	..
France	1,068	294	1,010	16	..	..
Germany	618	520	1,853	..	10	58
Hong Kong	1,119	..	165	..	..	..
Italy	398	25	385	13	59	..
Japan	820	34	..	31	..	..
Mexico	395	..	..	..	..	..
Netherlands	10	100	345	..	43	10
Norway	105	15	155	..	..	..
Other countries in South America	..	..	25	..	..	..
Palestine	78	..	33	..	..	1
Poland	300	..	560	..	..	..
Russia	7,905	..	5,275	90	..	..
Spain	500	..	200	..	..	..
Sweden	261	5	1,430	6	9	..
Switzerland	25	..	..	..	..	..
Syria	23	..	5	..	..	..
Turkey	93	..	20	..	..	..
Union of South Africa	1,091	67	..	..	..	..
United Kingdom	2,528	908	5,193	486	3	3
U. S. A.	19,468	2,771	28,286	1,165	..	829
Total	40,324	5,231	48,108	1,841	147	933

Foreign Imports of Rubber in Long Tons

Singapore Imports from	Dry Rubber	Wet Rubber (Dry Weight)
Banka and Billiton	35	..
British Borneo	825	48
Brunei	50	1
Dutch Borneo	1,105	54
French Indo-China	1,520	25
Other Dutch Islands	50	..
Rhio Residency	466	5
Sarawak	3,054	..
Siam	928	52
Sumatra	8,628	5,576
Total	16,661	5,761
Malayan Union Imports from		
Burma	307	11
Siam	1,355	44
Sumatra	1,088	715
Total	2,750	770

Dealers' Stocks

	Tons
Singapore	52,231
Penang & Province Wellesley	15,584
Total	67,815

Port Stocks in Private Lighters and Railway Godowns

Penang & Province Wellesley	9,178
Port Dickson	120
Port Swettenham	2,699
Singapore	20,988
Teluk Anson	400
Total	33,385

Financial

(*Continued from page 525*)

General Motors Corp., Detroit, Mich. Third quarter, 1947: consolidated net income, $75,658,274, equal to $1.65 a common share, against $24,644,813, or 71c a share, in the corresponding period in 1946; net sales, $941,773,864, against $622,618,885.

Minnesota Mining & Mfg. Co., Detroit, Mich., and subsidiaries. First three quarters, 1947: net profit, $8,381,830, equal to $4.30 a share, contrasted with $6,595,330, or $3.38 a share, in the 1946 months; sales, $68,550,239, against $52,309,301.

Raybestos - Manhattan, Inc., Passai N. J., and domestic subsidiaries. Januar 1-September 30, 1947: net profit, $1,50 914, equal to $2.39 a share, against $1,10 310, or $1.61 a share, in the correspondin period a year ago.

Sun Chemical Corp., New York, N. Y. and subsidiaries. First three quarter 1947: income, $996,670, equal to 78¢ eac on 1,196,283 common shares, contraste with $925,785, or 70¢ each on 1,131,2 shares, in the like period of 1946.

Taylor Instrument Cos., Rocheste N. Y. Year ended July 31: net incom $834,502, equal to $4.62 each on 180,4 common shares, compared with $632,391 $3.50 a share, in the preceding fiscal year net sales, $13,313,630, against $10,893,9

Timken Roller Bearing Co., Canton, O Nine months ended September 30: ne profit, $9,144,682, equal to $3.79 a shar contrasted with $1,194,357, or 49¢ a shar in the corresponding period a year ago.

Union Asbestos & Rubber Co., Chi cago, Ill. First three quarters, 1947: ne income, $738,119, equal to $1.49 a capit share, against $287,289, or 60¢ a share year earlier.

Dividends Declared

Company	Stock	Rate	Payable
American Hard Rubber Co.	Com.	$0.50 res.	Dec. 29
American Hard Rubber Co.	7% Pfd.	1.75 q.	Dec. 29
American Wringer Co., Inc	Com.	0.30 q.	Jan. 2
Anaconda Wire & Cable Co.	Com.	6.00 yr. end	Dec. 22
Anaconda Wire & Cable Co.	Com.	Stock*	Dec. 23
Armstrong Rubber Co.	"A" & "B"	0.25	Jan. 2
Armstrong Rubber Co.	"A" & "B" Pfd.	0.59 3/8 q.	Jan. 2
Baldwin Rubber Co.	Com.	25% Stock	Jan. 26
Baldwin Rubber Co.	Com.	0.17½ q.	Jan. 26
Boston Woven Hose & Rubber Co.	Pfd.	3.00 s.	Dec. 15
Crown Cork & Seal Co., Inc.	Com.	0.50 yr. end	Jan. 16
Dayton Rubber Co.	"A"	0.50q.	Jan. 26
Dayton Rubber Co.	Com.	0.30	Jan. 26
Denman Tire & Rubber Co.	Com.	0.10 extra	Jan. 2
Denman Tire & Rubber Co.	Com.	0.10 q.	Jan. 2
Denman Tire & Rubber Co.	5% Pfd.	0.12½ q.	Jan. 2
Detroit Gasket & Mfg. Co.	Com.	0.12½	Jan. 28
DeVilbiss Co.	Com.	0.25	Jan. 20
Dunlop Tire & Rubber Goods Co., Ltd.	Com.	1.25 yr. end	Dec. 19
Electric Hose & Rubber Co.	Com.	0.30	Nov. 26
Endicott Johnson Corp.	Com.	0.50 extra	Jan. 1
Endicott Johnson Corp.	Com.	0.40	Jan. 1
Endicott Johnson Corp.	4% Pfd.	1.00 q.	Jan. 1
Faultless Rubber Co.	Com.	0.50 yr. end	Jan. 2
Firestone Tire & Rubber Co.	Com.	1.00	Jan. 20
Garlock Packing Co.	Com.	0.10 extra	Dec. 27
Garlock Packing Co.	Com.	0.25 q.	Dec. 27
General Cable Corp.	Com.	0.25	Feb. 2
General Cable Corp.	4% Cum. 1st Pfd.	1.00 q.	Jan. 2
General Cable Corp.	4% Cum. Conv. 2nd Pfd.	0.50 q.	Jan. 2
General Electric Co.	Com.	0.40	Jan. 26
General Tire & Rubber Co.	4¼% Pfd.	1.06¼ q.	Dec. 31
General Tire & Rubber Co.	3¾% Pfd.	0.93¾ q.	Dec. 31
General Tire & Rubber Co.	3¾% Pfd.	0.81¼ q.	Dec. 31
Goodyear Tire & Rubber Co. of Canada, Ltd.	Com.	4.00 yr. end	Jan. 2
Gro-Cord Rubber Co.	Com.	0.10	Dec. 31
Hewitt-Robins, Inc.	Com.	1.00 yr. end	Jan. 20
Jenkins Bros.	Com.	0.50	Dec. 26
Jenkins Bros.	Fdrs.	2.00	Dec. 26
Jenkins Bros.	Pfd.	1.75 q.	Dec. 26
Jenkins Bros., Ltd.	Com.	0.50 interim	Jan. 23
Johns-Manville Corp.	Pfd.	0.87½	Feb. 2
Johnson & Johnson	8% Pfd.	4.00 s.	Jan. 31
Johnson & Johnson	4% 2d Pfd.Ser."A"	1.00 q.	Feb. 2
I. B. Kleinert Rubber Co.	Com.	0.25	Dec. 12
Mansfield Tire & Rubber Co.	Com.	1.00 extra	Dec. 20
Mansfield Tire & Rubber Co.	Com.	0.25 q.	Dec. 20
Mansfield Tire & Rubber Co.	$1.20 Pfd.	0.30 q.	Jan. 2
Midwest Rubber Reclaiming Co.	Pfd.	0.56¼ q.	Jan. 2
O'Sullivan Rubber Corp.	Pfd.	0.25	Jan. 1
Plymouth Rubber Co., Inc.	Com.	0.25	Jan. 2
Rome Cable Corp.	Pfd.	0.30	Jan. 2
Russell Mfg. Co.	Com.	0.37½	Dec. 15
Seiberling Rubber Co.	Pfd. "A"	1.25 q.	Jan. 1
Seiberling Rubber Co.	4½% Pfd.	1.12½ q.	Jan. 1
Thermoid Co.	Com.	0.20 q.	Dec. 15
U. S. Rubber Reclaiming Co.	Pfd.	0.35 q.	Jan. 2
Westinghouse Air Brake Co.	Com.	0.50	Dec. 29
Whitney Blake Co.	Com.	0.25 s.	Dec. 22

*One additional share for each share held. Subject to approval.

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(Classified Advertisements Continued on Page 553)

Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	October, 1947		October, 1946	
UNMANUFACTURED	Quantity	Value	Quantity	Value
Balata .... lbs.	800	$ 3,216	13,490	$ 10,276
Crude rubber .... lbs.	4,845,617	707,794	8,516,068	1,999,827
Latex .... lbs.	59,551	18,434	146,599	36,828
Rubber, powdered and waste .... lbs.	151,000	9,383	1,573,600	34,690
Recovered .... lbs.	2,047,500	171,513	1,091,800	87,636
Synthetic and substitute .... lbs.	252,500	63,372	250,300	59,783
TOTALS.	7,356,968	$ 973,712	11,591,857	$2,229,040
PARTLY MANUFACTURED				
Comb blanks of hard rubber	......	$ 595	......	$ ......
Hard rubber in rods or tubes .... lbs.	245	223	6,211	3,431
Rubber thread, not covered .... lbs.	7,663	8,978	13,760	24,395
TOTALS.	7,908	$ 9,796	19,971	$ 27,826
MANUFACTURED				
Belting	......	$ 147,943	......	$ 59,423
Boots and shoes of rubber, n.o.p. .... prs.	43,915	54,765	12,460	7,294
Canvas shoes with rubber soles .... prs.	1,997	4,441	114	441
Cement	......	55,483	......	39,641
Clothing of waterproofed cotton or rubber	......	10,178	......	7,615
Druggists' sundries	......	53,839	......	35,660
Gaskets and washers	......	44,837	......	30,929
Gloves .... doz. prs.	1,040	4,972	784	3,030
Golf balls .... doz.	568	3,289	792	5,301
Heels .... prs.	2,615	265	1,416	249
Hose	......	45,267	......	42,317
Hot water bottles	......	1,494	......	4,864
Inner tubes, n.o.p. .... no.	643	2,517	23,126	119,604
Bicycle .... no.	1,876	1,430	232	166
Liquid sealing compound .	......	9,859	......	8,526
Mats and Matting	......	72,630	......	81,621
Nursing nipples .... gross	1,255	6,893	1,304	5,097
Packing	......	9,859	......	11,324
Raincoats .... no.	680	1,125	3,660	9,441
Tires pneumatic, n.o.p. no.	5,032	88,407	40,644	1,466,046
Bicycle .... no.	1,784	2,210	2,925	3,523
Solid for automobile and motor trucks no.	71	1,368	48	927
Other	......	2,348	......	7,939
Tire repair material	......	12,794	......	122,497
Other rubber manufactures	......	399,420	......	256,220
TOTALS.	......	$1,037,633	......	$2,329,695
TOTAL RUBBER IMPORTS.	......	$2,021,141	......	$4,586,561

Exports of Crude and Manufactured Rubber

	October, 1947		October, 1946	
UNMANUFACTURED	Quantity	Value	Quantity	Value
Crude rubber .... lbs.	3,762,668	$ 629,587	6,421,353	$1,187,568
Waste rubber .... lbs.	922,300	10,161	1,390,500	20,976
TOTALS.	4,684,968	$ 639,748	7,811,853	$1,208,544
PARTLY MANUFACTURED				
Soling slabs of rubber lbs.	......	$	8,402	$ 2,014
MANUFACTURED				
Belting, n.o.p. .... lbs.	265,389	$ 181,030	29,162	$ 21,420
Belts, fan	......	1,071	......	2,686
Boots and shoes of rubber, n.o.p. .... prs.	327,145	507,061	89,742	149,567
Canvas shoes with rubber soles .... prs.	149,122	124,007	161,513	165,328
Clothing of rubber and waterproofed clothing ..	......	23,298	......	14,017
Heels .... prs.	2,720	678	134,718	9,269
Hose	......	69,044	......	34,732
Inner tubes for motor vehicles .... no.	38,655	108,256	1,520	2,217
Soles .... prs.	797	117	30,175	7,278
Tires, pneumatic for motor vehicles .... no.	54,519	905,885	1,519	18,820
Other .... no.	......	......	238	1,235
Wire and cable, copper, insulated	......	136,174	......	10,927
Other rubber manufactures	......	47,657	......	20,684
TOTALS.	......	$2,104,278	......	$ 458,180
TOTAL RUBBER EXPORTS:	......	$2,744,026	......	$1,668,738

Contributions of Chemistry

(Continued from page 486)

sions from 50-75%. The method used to study the shortstopping effect of an organic compound consisted of carrying the polymerization to approximately 50%, at which time the shortstop was added and the heating continued for 15 hours at 50° C. (46-48). The change in conversion was then noted. With the good shortstopp agents a concentration of 0.1 to 0.2% (on the monomer gives an increase in conversion of less than 5% af addition and heating 15 hours at 50° C.

In addition to the property of terminating polymeriz tion by deactivation of the persulfate, several oth properties must be considered. The substance must non-toxic if it remains in the rubber, and the efflu waters containing it must not be toxic to fish. It sho have little or no effect on the cure rate or the aging the compounded rubber, and for certain uses of latex must be non-discoloring. It is also desirable that shortstopping agent act as a latex and polymer stabiliz to preserve the physical properties against oxidation a heat, that is possess antioxidant properties. The m effective shortstopping agents are not good stabilize and it is therefore necessary to add such a material al with the shortstop.

In Table 14 are listed some of the most effective sho stopping agents together with the concentration nece sary to stop polymerization at approximately 50% co version. Phenolic compounds, aromatic and alipha amines, amino phenols and disulfides were among t most effective compounds tested. Diphenolsulfide, tetr methylthiuram disulfide, Santovar O, and hydroxylami (46) are nondiscoloring shortstopping agents (47, 4

TABLE 14. EFFECTIVE SHORTSTOPPING AGENTS

Phenols		S-Compounds	
Hydroquinone	0.06	Diphenol sulfide	
α-Naphthol	0.1	Tetramethylthiuram disulfide	
β-Naphthol	0.1	Ethyl zimate	
p-Aminophenol	0.1	2-Mercapto thiazoline	
Santovar O	0.2	Miscellaneous	
2,4,6-Trimethylphenol	0.2		
p-Tert.-butylcatechol	0.3	Hydroxylamine	
2,4-Dimethyl-6-t-butylphenol	0.2	Phenylethanolamine (46)	
Amines		2,4-Dinitrochlorbenzene	
Aniline	0.1	Butyraldehydebutylidene aniline	
α-Naphthylamine	0.1	Sodium sulfide	
β-Naphthylamine	0.1		

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(51) Kolthoff, Lee, Carr, private communication, University of Minne to ORR, May 3, 1946.

(To be continued)

"Silene EF and Calcene T in GR-S-10, GR-S-X-141, an GR-S-X-245." Columbia Pigments Data Sheet No. 47-7. Pittsburgh Plate Glass Co., Pittsburgh 13, Pa. 22 pages. Extensi tables and charts of laboratory test data are presented on t use of Silene EF and Calcene T in the subject polymers. Vu canizates of all three polymers and their blends gave physic properties superior to those of standard GR-S with similar loa ings of pigment. GR-S-X-141 stocks loaded with Calcene were difficult to process without the use of special plasticizer the other polymers and blends processed satisfactorily.

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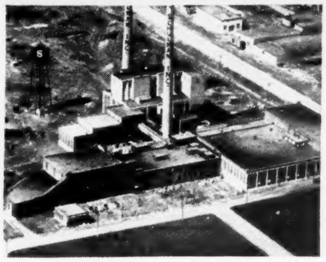

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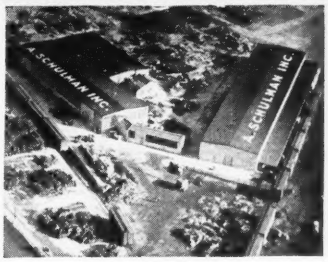

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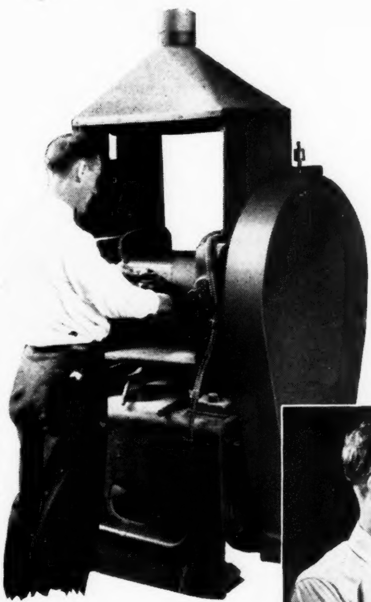

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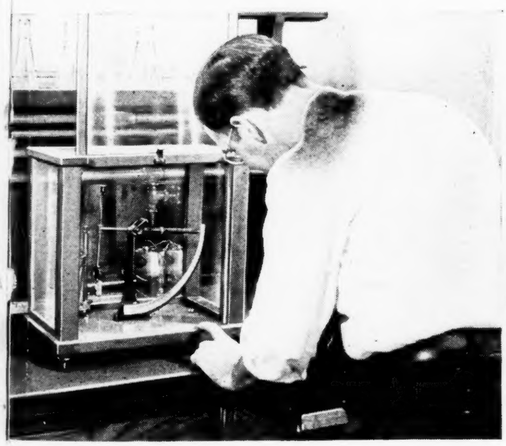

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